Guidelines for the Management of Adult Patients with Brain & Other CNS Tumours 2013
Version Control

This is a controlled document please destroy all previous versions on receipt of a new version.

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<td>Brain &amp; CNS CEG</td>
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<td>January 2015</td>
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For the latest version of these guidelines please see the NEYHCA (Cancer) website
Please press control and click on the link below:

http://www.hyccn.nhs.uk/NetworkGuidelinesAndPublications/bcns.htm
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Foreword

A guideline is “not a rigid constraint on clinical practice, but a concept of good practice against which the needs of the individual patient can be considered.” (RCR 1990)

It remains the responsibility of the practising Clinicians to interpret the application of guidelines, taking into account local service constraints and the needs and wishes of the patients.

In reviewing the summary guidelines, local clinicians and managers will be required to assess whether the guidance can be met; and if not, what service developments need to be undertaken to achieve the ‘ideal service’ as defined by the available evidence.

Objectives & Methodology

The Manual for Cancer Services states that the Clinical Expert Group should agree clinical and referral guidelines. Guidelines define structure, process and standards against which the development and quality of the service can be assessed through audit. They also allow the service to be reviewed against the ideal, in order to direct effective service development and investment, and ensure seamless care is delivered and maintained between primary, secondary and tertiary sectors.
1. Introduction

NICE published Improving Outcomes Guidance (IOG) for People with Brain and Other Central Nervous System (CNS) tumours in June 2006.

This guidance gives advice about the optimal management of this group of patients.

The scope of the Brain and other CNS tumours IOG is huge and these guidelines concentrate on the more common types of tumours encountered. As such the guidelines are not comprehensive but deals with most common or problems areas in CNS tumour management. For particularly rare tumours the Neurosciences MDT (nMDT) should be consulted for advice.

The main guiding principle is that the management of patients with Brain or CNS related tumours must be co-ordinated by a Cancer Network MDT (cMDT) with patients requiring specialist Neurosurgical, Neurological or Neuro-oncological input additionally being managed via a Neurosciences MDT (nMDT).

Rapid communication and clear pathways for prompt referral for investigation, management and supportive care by specialist teams are key elements in delivering this service.

The Guidelines cover a diverse group of tumours including the following broad groups:-

Common Tumours affecting the brain, directly, or indirectly.

1. Primary CNS tumours
   High Grade and Low Grade Gliomas
   Meningiomas
   Pituitary and related tumours
   Skull Base Tumours
   Primary CNS Lymphoma
   Medulloblastoma and primitive neuroectodermal tumours.
   Pineal Tumours
   Optic Pathway Gliomas
   Germinomas
   Intradural Spinal Cord Tumours

2. Metastases
   Known Primary
   Unknown Primary

Precise evidence for the best management of some groups is sparse, a consensus approach is common and treatment must be individualised based on patients’ general condition, co morbidities, performance status and psychosocial status.

1.1 Cancer Waiting Times Standards

It is of key importance that patients are managed in a timely fashion and there are a number of important timed “access to treatment targets” against which services will be audited for best patient care.
The Current Cancer Waiting Time Standards in place are:

- Maximum of 14 days from Urgent GP Referral to Date First Seen
- Maximum of 62 days from Urgent GP referral to First Definitive Treatment
- Maximum of 31 days from Decision to Treat to First definitive Treatment

Treatment definitions can vary and whilst surgical debulking by craniotomy is a definitive treatment, surgical biopsy is not a definitive treatment.

From December 2009 the following “Going Further on Cancer Waiting Times Standards” have become operational:

- Maximum of 31 Days from Decision to Treat or Earliest Clinically Appropriate Date (ECAD) to Treatment for all chemotherapy and surgical treatments
- Maximum of 62 days from Consultant Upgrade Date to First definitive Treatment for any patient with signs or symptoms of cancer upgraded by a hospital specialist to the 62-day pathway.

From December 2010 the following additional standard applies:

- Maximum of 31 days from Decision to Treat or Earliest Clinically Appropriate Date (ECAD) to Treatment for all radiotherapy treatments.

### 1.2 Communication Targets

NEYHCA (Cancer) patients will be managed by a Neuroscience Multidisciplinary Team (nMDT), a Cancer Network Multidisciplinary Team (cMDT) and the Specialist Pituitary MDT where appropriate.

Communication is key to successful management and the service will strive to meet the targets outlined in the following table below. (Please also see section 2.21 and the Communication Framework in Appendix i.)
## Communication Targets

<table>
<thead>
<tr>
<th>Action</th>
<th>Timeframe</th>
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<tr>
<td>Logging of patient with possible CNS tumour on to nMDT database</td>
<td>Within 1 week of imaging</td>
</tr>
<tr>
<td>Clinical summary from referring clinician</td>
<td>Within 2 working days of imaging report</td>
</tr>
<tr>
<td>Written summary of proposed management plan produced by the nMDT sent back to referring clinician, and cancer network MDT and GP</td>
<td>Within 1 working day of MDT</td>
</tr>
<tr>
<td>Informing patient, their relatives or carers of diagnosis and management plan</td>
<td>Within 1 working day of MDT for inpatients and 5 working days for outpatients</td>
</tr>
<tr>
<td>Referral to rehabilitation and supportive care services and palliative care team where appropriate</td>
<td>Within 1 working day of the decision</td>
</tr>
<tr>
<td>Referral to the cMDT for further management</td>
<td>Within 2 working days of discharge from neurosurgical care</td>
</tr>
<tr>
<td>Discussion of key worker appointment and their role with the patient, their relatives and carers.</td>
<td>Within 1 working day of MDT for inpatients and 5 working days for out patients.</td>
</tr>
<tr>
<td>Referral back to the nMDT for further management</td>
<td>Within 1 working day of decision.</td>
</tr>
</tbody>
</table>
2. Service Organisation & Provision

2.1 Secondary Care Management

- The Specialist Centre and Localities have agreed clear local policies for the management of Brain & CNS tumours. These policies are designed to ensure the co-ordination of high quality care between the Specialist Centre, Localities, Palliative Care and community services.

- There are rapid and efficient communication systems for liaison and cross referral between all levels of service, including primary care, psychologist, cancer genetic specialists, social workers and palliative care.

- In order to maintain expertise, a minimum of 100 new cases of primary intracerebral malignancy should be seen per annum.

- Within the NEYHCA (Cancer) there is
  - One Brain & CNS Clinical Expert Group (CEG)
  - One weekly Neuroscience Multidisciplinary Team (nMDT) meeting hosted at Hull Royal Infirmary (HRI)
  - One monthly stand alone Cancer Network Multidisciplinary Team (cMDT) meeting hosted at HRI
  - One monthly specialist Pituitary Multidisciplinary Team meeting hosted at HRI
  - Named specialist multidisciplinary clinics covering the population of NEYHCA (Cancer) hosted at HRI

The nMDT covers the following tumour groups:

- Brain & and other rare CNS tumours
- Skull based tumours
- Spinal cord tumours.

2.11 Specialist Centre

_Hull & East Yorkshire Hospitals NHS Trust_ provides local, diagnostic and specialist Brain & CNS Cancer services for the population of Hull and the East Riding. HEYHT also provides specialist cancer services to Scarborough and North East Yorkshire Healthcare NHS Trust, North Lincolnshire and Goole Hospitals NHS Foundation Trust & York Teaching Hospital NHS Foundation Trust – part of Yorkshire Cancer Network (YCN).

Each HEYHT neurosurgeon has a weekly general neurosurgical clinic. In addition there are three joint Neurosurgeon and Oncologist clinic once a month, one Low grade glioma clinic jointly held by a neurosurgeons and neurologist and Specialist nurse. There is joint pituitary clinic involving neurosurgeon and neuroendocrinologist.

2.12 Locality Services

_Northern Lincolnshire and Goole Hospitals NHS Foundation Trust (NLGHFT)_ provides local and diagnostic Brain & CNS Cancer services for the population of Northern Lincolnshire and Goole. All patients diagnosed with Brain & CNS Cancers are referred to & discussed at the Specialist MDT based in Hull and East Yorkshire Hospitals NHS Trust.
Scarborough and North East Yorkshire Healthcare NHS Trust (SNEYHT) provides local and
diagnostic Brain & CNS Cancer services for the population of Scarborough and North East
Yorkshire.

All patients diagnosed Brain & CNS Cancers are referred to & discussed at the Specialist MDT
based in Hull and East Yorkshire Hospitals NHS Trust.

York Teaching Hospital NHS Foundation Trust provides diagnostic and local Brain & CNS cancer
services for the population if YCN at York District Hospital (YDH).

Referrals can be made to the specialist services at Hull Royal Infirmary, however York can also
refer patients to Leeds due to the geography of the region & patient choice.

There are named lead clinicians, at consultant level for Brain & CNS cancers for each locality
trust, with specified time and a list of responsibilities for the role agreed by the trust cancer lead
clinician.

The lead clinicians for Brain and CNS cancers from referring trusts are:

- Scarborough Hospital Dr Tadas Zuromskis
- York District Hospital Dr Phil Duffey
- Scunthorpe Dr Amit Bannerjee
- Grimsby Dr Jayam Lazarus

There are no Brain & CNS Clinical Nurse Specialist posts in NLGHFT, SNEYHT or YDH.

The referring trusts do not conduct any specialist neuro oncology clinics. This service is provided
by HEYHT at Hull Royal Infirmary (HRI).

Presentation / diagnostic / treatment / follow up / communication & palliative care pathways and
the localities role within that pathway have been agreed by the Trust lead clinician for Brain &
CNS cancers.

2.2 Emergency Surgical Intervention Protocol / Distribution

A copy of this protocol is also available on the NEYHCA (Cancer) website

http://www.hyccn.nhs.uk/NetworkGuidelinesAndPublications/bcns.htm

This protocol covers NEYHCA (Cancer) and deals with emergency surgical interventions in
patients with CNS malignancy, for intra CNS problems caused by the tumour or its treatment.

The emergency surgical intervention protocol has been agreed by the Chair of the Brain & CNS
Clinical Expert Group and the Trust Lead Clinicians. The protocol has been distributed to A&E
departments, surgeons on the acute surgical take rota and neurosurgeons.

There are occasions when a brain tumour patient is referred to neurosurgery department in
HEYHT as an emergency. The on call consultant neurosurgeon decides the emergency
management to be carried out immediately. The consultant makes this decision based on
neurological status, neuroradiological findings and other relevant clinical information and
assessment.
If required the consultant may have to operate on the brain tumour as an emergency. The patient will be discussed with one of the three tumour surgeons on the next working day and further management decided either by discussion between the consultants or in next available nMDT / cMDT. The long term follow up of these patients is covered by one of the tumour surgeons.

If the decision about management of a brain tumour patient cannot wait till next available nMDT / cMDT meeting due to the patient's clinical condition, a discussion takes place between at least two consultant neurosurgeons, one of which is tumour surgeon.

The patient is also discussed with a consultant neuro radiologist and consultant oncologist if required.

The treatment of the patient is reported and discussed in the next available nMDT / cMDT meeting.

When a patient presents to one of the locality hospitals (NLGHFT / SNEYHT) with acute neurological features, the consultant physician on call performs necessary imaging within the hospital.

If a brain or other CNS tumour is revealed, the local treating team should refer the patient to the neurosurgical registrar on call for advice on any emergency treatment and / or transfer to Hull Royal Infirmary for emergency neurosurgical intervention.

Also, the patient is referred to the nMDT / cMDT co-ordinator for discussion in next MDT.

MRI & CT scan images should be transferred electronically to the radiology core MDT member being discussed at MDT.

2.3 Operational Policy for Neuro-rehabilitation Facilities / Distribution

The trust has agreed an operational policy for neuro-rehabilitation facilities, naming the facilities either hosted by the trust or to which, according to the policy, the trust would refer patients to. This policy has been distributed to the lead clinicians of the nMDT / cMDTs, clinical leads and relevant managers of any neuro-rehabilitation facilities hosted by the trusts.

The Neurorehabilitation Operational Policy is available as a separate document and can be found on the NEYHCA (Cancer) website. Please press control and click on the following link:

http://www.hyccn.nhs.uk/NetworkGuidelinesAndPublications/bcns.htm

Please also refer to the Brain & CNS Rehabilitation pathway for further information

http://www.hyccn.nhs.uk/NetworkGuidelinesAndPublications/rehab.htm

2.4 Multi Disciplinary Teams (MDTs)

The lead for the HEYHT Brain & CNS service is Mr Shailendra Achawal.

In the NEYHCA (Cancer) the nMDT is held weekly on a Friday afternoon at 1pm at Hull Royal Infirmary. All the surgical treatment for Brain and other CNS cancers takes place at HRI.
The nMDT meets weekly with appropriate invitees, and discussed approximately 5 - 15 new patients and 12 - 25 follow up patients. The planned cMDT will meet monthly. Details of the meeting arrangements are to be confirmed.

The nMDTs / cMDT have separate meeting agendas and membership lists. Members and roles are described in the table on the next page and named in the nMDT / cMDT key documents.

The nMDT / cMDT discusses the management of the following tumours

- Skull Base
- Spinal Tumours
- Brain and other CNS tumours

In addition to the nMDT / cMDT there is a separate specialist Pituitary MDT held at HRI on the 3rd Tuesday of every month, 4.00 – 5.00 pm, in the Maxillofacial MDT room at HRI.

### 2.5 Neuroscience (nMDT) and Cancer Network MDTs (cMDT) Membership

Named / actual members can be found in the MDTs operational policies, the following table specifies the minimum requirements for each team:

<table>
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<tr>
<th>MDT Member</th>
<th>nMDT</th>
<th>cMDT</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Neurosurgeon (2)</td>
<td>✓</td>
<td>n/a</td>
<td>Specialist with 50% of time in Neuro-oncological surgery &amp; clinics</td>
</tr>
<tr>
<td>Neuroradiologist (1)</td>
<td>✓</td>
<td>n/a</td>
<td>50% PAs in Neuroradiology / Specialist Interest in CNS Imaging – substantive post</td>
</tr>
<tr>
<td>Neuropathologists (2)</td>
<td>✓</td>
<td>n/a</td>
<td>Accredited and in EQA scheme endorsed by British Neuropathology Society *see note in measures 1WTE per million of the population / catchment area</td>
</tr>
<tr>
<td>Neurologist (1)</td>
<td>✓</td>
<td>(Extended Team)</td>
<td>Expertise in Neuro-oncology, epilepsy or Neuro-rehabilitation. Specified DCC PAs</td>
</tr>
<tr>
<td>Clinical / Medical Oncologist (2)</td>
<td>✓</td>
<td>✓</td>
<td>Special interest in tumours of the CNS / Designated Neuro-oncologist for the Cancer Network. Radiotherapy &amp; chemotherapy. (If not responsible for chemotherapy a second oncologist is required) Specified DCC PAs for attendance at specialist clinic.</td>
</tr>
<tr>
<td>Clinical Nurse Specialist (1)</td>
<td>✓</td>
<td>✓</td>
<td>Specialist knowledge as per Cancer Services Manual. Specified DCC PAs for attendance at specialist clinic.</td>
</tr>
<tr>
<td>Clinical Neuropsychologist</td>
<td>✓</td>
<td>n/a</td>
<td></td>
</tr>
<tr>
<td>MDT Member</td>
<td>nMDT</td>
<td>cMDT</td>
<td>Description</td>
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<tr>
<td>A Therapy Radiographer</td>
<td>✓</td>
<td>n/a</td>
<td>A Therapy Radiographer with a Special Interest in patients with CNS Tumours who has dedicated time to participate in the local MDT</td>
</tr>
<tr>
<td>Core Member Specialist Palliative Care Team (1)</td>
<td>✓</td>
<td>✓</td>
<td>Healthcare professional (normally a member of the palliative care team) with expertise in the palliative care of patients with CNS tumours (Neuro-oncology Clinical Nurse Specialist acts as link with occasional presence of consultant in Palliative Care in the MDT)</td>
</tr>
<tr>
<td>MDT Co-ordinator / secretary (1)</td>
<td>✓</td>
<td>✓</td>
<td>Responsible for co-ordinating Patient Registration and Data collection, Recording and distributing information</td>
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<tr>
<td>Specialist AHP(s) to liaise with neurorehabilitation group</td>
<td>✓</td>
<td>n/a</td>
<td>Representatives with specialist knowledge and experience in dealing with this patient group (attend as required) * see note in measures</td>
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<tr>
<td>Occupational Therapist (1)</td>
<td>n/a</td>
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<td>Time specified in job plan for care of patients with CNS malignancy</td>
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<td>Speech &amp; Language Therapist (1)</td>
<td>n/a</td>
<td>✓</td>
<td>Time specified in job plan for care of patients with CNS malignancy</td>
</tr>
<tr>
<td>Physiotherapist (1)</td>
<td>n/a</td>
<td>✓</td>
<td>Time specified in job plan for care of patients with CNS malignancy</td>
</tr>
<tr>
<td>NHS member responsible for Patient / user issues (1)</td>
<td>✓</td>
<td>✓</td>
<td>Nominated / elected by the MDT</td>
</tr>
<tr>
<td>Member responsible for research (1)</td>
<td>✓</td>
<td>✓</td>
<td>Nominated / elected by the MDT</td>
</tr>
<tr>
<td>Extended team</td>
<td>Epilepsy nurse specialist Neuropsychiatrist</td>
<td>Neurologist Radiologist Dietician Clinical psychologist Psychiatrist</td>
<td>Representatives from ward nursing, Community palliative nursing, neuropsychology (all as required)</td>
</tr>
</tbody>
</table>

2.51 Additional membership required for an nMDT / cMDT declared dealing with pituitary tumours:
- A neurosurgeon with a practice in pituitary surgery or ENT surgeon with a practice in pituitary surgery
- An endocrinologist with a practice in pituitary disorders

Extended team
- Neuropsychiatrist
- Clinical neuropsychologist
- Ophthalmologist
- AHP to liaise with neurorehabilitation group
2.52 Additional membership required for an nMDT / cMDT declared dealing with spinal tumours:
- A neurosurgeon with a practice in spinal surgery or an orthopaedic surgeon with a practice in spinal surgery
- An AHP agreed as having responsibility for liaison with neurorehabilitation services

Extended team
- Neuropsychiatrist
- Clinical neuropsychologist
- Core Member Specialist Palliative Care Team

2.53 Additional membership required for an nMDT / cMDT agreed dealing with skull base tumours:

A combination of surgeons: roles should fulfil the following:
- Mandatory minimum core membership consists of a neurosurgeon with a practice in skull base surgery plus at least one, out of the following (whichever, with a practice in skull base surgery), ENT, maxillofacial, plastic surgeon
  - If not included as a core member, there should be ENT, maxillofacial, and ophthalmic surgeons as mandatory extended team members
  - An AHP agreed as having responsibility for liaison with neurorehabilitation services

Extended team
- Neuropsychiatrist
- Clinical neuropsychologist
- at least one of the core members should be trained in reconstructive surgery including microvascular reconstruction
- Core Member Specialist Palliative Care Team
- ENT surgeon with a practice in skull based surgery
- A maxillofacial surgeon with a practice in skull based surgery
- An ophthalmic surgeon with a practice in skull based surgery

2.6 Role of Neuroscience Multidisciplinary Team (nMDT)

The nMDT is the team responsible for the diagnosis and initial management (both surgical and non-surgical aspects of care) of most adult patients with CNS tumours and has the following roles:

- A representative should be sent to at least two thirds of the Brain & CNS CEG meetings.
- The MDT should have a written procedure governing how to deal with referrals that need a treatment planning decision before the next scheduled meeting.
- A record of core member attendance should be maintained.
- Each surgical & neuroradiologist core MDT member should have 50% of their direct clinical care programmed activities (DCC PAs) specified for work related to and including relevant elective surgery and the management of neuro-oncology patients, including attendance at the nMDT. Where surgeons are dealing with both brain and other rare CNS tumours and spinal tumours, they should spend 50% on brain and other rare CNS tumours and the remaining 50% on spinal tumours.
- Each surgical core MDT member should have DCC PAs specified for work related to and including relevant elective surgery (pituitary or skull base, as the case may be) and the management of neuro-oncology patients, including attendance at the MDT.
Each oncologist & nurse specialist MDT core member should have specified DCC PAs for attendance at a multidisciplinary specialist clinic as agreed and defined in the relevant measures for the Cancer Management Group and the trusts.

Each core member should attend a regular, at least weekly, tumour review / case management multidisciplinary meeting. Sub specialist meetings will take place once a month.

Appropriate cross cover should always be available and cover arrangements should be agreed by the MDT. The core members, or their arranged “cover”, should attend at least two thirds of the number of meetings. “Cover” need not be a Consultant, but should be a Specialist Registrar or Staff Grade. Cover for the AHP need not be from the same profession, but they should have Brain & CNS experience.

Establish a diagnosis for optimal clinical management of the patient. There should be an operational policy which specifies that all new cancer patients will be reviewed by the nMDT at least:
- Post initial radiological diagnosis, pre-, potential histological confirmation
- Post histological confirmation pre-, potential definitive surgical procedure;
- Post definitive surgical procedure, pre-, potential adjuvant treatment
- Any other times as are agreed in the area-wide patient pathways.

Develop & record individual management plans for patients with CNS tumours at first presentation, to include patients identity, stage of the patients pathway, initial supportive care needs, diagnostics and surgical interventions, non-surgical oncology interventions, treatment of symptoms and follow up.

There should be an agreed operational policy whereby the MDT allocate and record a key worker as contact point for patient relatives and carers.

Patients should be offered a permanent record / summary of at least one consultation where the following are discussed: Diagnosis, Treatment options and plans, Relevant follow up / discharge arrangements.

The MDT should provide patients and carers with specific written material.

Inform diagnostic clinician / team at local referring hospital and GP of management plan.

The MDT should have agreed a policy whereby after a patient is given a diagnosis of cancer, the patient’s general practitioner is informed of the diagnosis by the end of the following working day.

Feedback should be given to referring GPs and other PCTs on the appropriateness and timeliness of urgent suspected cancer GP referrals, following an audit of the process.

Inform the Cancer Network MDT of the management plan.

Review and advise on NEYHCA (Cancer) Policies with the Cancer Network MDT, to define appropriate follow up and imaging requirements for patients with CNS tumours.

Implement National Management Protocols for CNS Lymphoma, Medulloblastoma, pineal tumours and optic gliomas.

Act as an educational resource for local service providers.

Develop and maintain evidence based local area-wide clinical guidelines, management protocols & pathways covering all aspects of the patient diagnostic / treatment / follow up / communication pathways. The MDTs role in these pathways and any locally relevant content including named hospital services should be agreed.

Participate in regular CEG meetings to review care pathways and protocols. (An nMDT core member should attend at least two thirds of CEG meetings).

Liaise with the Cancer Network MDT.

The core team members need to meet on a quarterly basis to discuss, review, agree and record at least some of the operational policies.

At least those core members of the team who have direct clinical contact with patients should have attended the national advanced communication skills training.
• Each core nurse specialist member who should have successfully completed a programme of study in their specialist area of nursing practice, which has been accredited for at least 20 credits at 1st degree level.
• The MDT should have an agreed list of responsibilities with each of the core nurse members.
• The MDT should discuss at least new 100 cases of primary intracerebral malignancy per year.

2.7 Additional Roles of the Cancer Network MDT (cMDT)

The cMDT is the coordinating team for the non-surgical management of most adult patients with CNS tumours. As well as incorporating elements of the nMDT roles already mentioned, the cMDT also has the following roles:

• Implement the non-surgical aspects of the management plan produced by the nMDT.
• Ensure that there is a system in place for implementing the next stage of the management plan.
• Ensure that there are systems in place for the continuous assessment of the needs of patients, their relatives and carers and provide appropriate provision of support.
• Re-refer patients to the nMDT where appropriate and as defined in local protocols.
  Inform the local referring hospital or community services in continuing, palliative and supportive care where appropriate and provide specialist advice to local healthcare professionals when needed.
• Liaise with the nMDT.
• Involve the local referring hospital / community services in continuing supportive, rehabilitative and palliative care where appropriate.

2.8 Lead Clinician Responsibilities

There is a single named lead clinician for each MDT, who is also a core member of the MDT ad has agreed responsibilities as set out in the Cancer Quality Measures/ Improving Outcomes Guidance (IOG):

• To ensure that objectives of MDT working (as laid out in Manual of Cancer Service Standards) are met.
• To ensure that designated specialists work effectively together in teams such that decisions regarding all aspects of diagnosis, treatment and care of individual patients and decisions regarding the team’s operational policies are multidisciplinary decisions.
• To ensure that care is given according to recognised guidelines (including guidelines for onward referrals) with appropriate information being collected to inform clinical decision making and to support clinical governance/audit.
• To ensure mechanisms are in place to support entry of eligible patients into clinical trials, subject to patients giving fully informed consent.
• Overall responsibility for ensuring that MDT meeting and team meet Peer Review Quality Measures.
• Ensure attendance levels of core members are maintained in line with Quality Measures.
• Ensure that target of 100% of cancer patients discussed at the MDT is met.
• Provide link to CEG, either by attendance at meetings or by nominating another MDT member to attend.
• Lead on, or nominate lead for Service Improvement.
• Organise and Chair annual meeting examining functioning of team and reviewing operational policies, and collate any activities that are required to ensure optimal functioning of the team (e.g. training for team members).
• Ensure MDT’s activities are audited and results documented.
• Ensure that the outcomes of the meeting are clearly recorded and clinically validated and that appropriate data collection is supported.
• Ensure target of communicating MDT outcomes to primary care is met.
• Ensure that processes are in place for obtaining information about patients directly from the clinician who arranged the imaging, if this is not forthcoming.
• Refer onwards patients with spinal cord, pituitary or skull base tumours if inappropriately referred to this MDT.

2.9 Management of the nMDT / cMDT & Contact Information

Collation of data, agenda setting and data collection are the responsibility of the MDT Data Co-ordinator / Manager.

For the nMDT / cMDT, the responsible person is

Ms Joanne Ward,
Tues – Friday 09.30 15.00,
Tel: 01482 607841 (Voicemail)
Fax: 01482 607892
Email: jo.ward@hey.nhs.uk
Address Neuro oncology MDT Co-ordinator, 6th Floor, Alderson House, Hull Royal Infirmary, Anlaby Road, Hull, HU3 2JZ

The preferred method of contact is by NHS.net email, but secondarily by fax. Please note to ensure confidential transfer of patients identifiable information. The email transfer should be NHS.net email to NHS.net email.

The Neuroscience MDT contact email is Hull.Neurooncology@nhs.net.
The fax number is 01482 607892.

Key information about the neurosurgery department is available on the HEYHT website. Please press control and click on the following link:

http://www.hey.nhs.uk/content/services/neurosurgery.aspx

2.10 Referral to the nMDT / cMDT

All new patients with brain and other CNS tumours, skull base tumours, pituitary tumours and spinal tumours must be referred for discussion at the nMDT / cMDT at HRI whether they are from within NEYHCA (Cancer) or from a surrounding Network.

Tumours referred on call may need to be reassigned more appropriately to other consultants via the MDT.

A copy of the 2WW referral form can be found in Appendix ii
The nMDT / cMDT referral form can be found in Appendix iii
Primary Care Referral Guidelines can be found in Appendix iv. This includes the Presentation pathway.
All referrals should be notified to the MDT coordinator within one working day of imaging suggestive of a brain tumour who will report these to the lead clinician. This referral should be in addition to the referral made to the neurosurgical registrar on call for advice on emergency management of the patient.

For each person referred to the nMDT / cMDT, a basic data form will be required detailing basic parameters especially communication parameters (Please see Appendix iii, the nMDT / cMDT Referral Form). The form is also available via the HEYHT Internet and the HEYHT website Please press control and click on the following links:

http://intranet/neurosurgery/proforma.asp
http://www.hey.nhs.uk/content/services/neurosurgery.aspx

This form will have to be completed by all referrers to ensure that contact details and scan locations are recorded.

Any referrals to the nMDT / cMDT should be made by a faxed referral letter or copy of the referring Unit’s completed MDT proforma to:

The MDT co-ordinator will add the patient to the MDT for discussion and highlight these referrals to the MDT lead. The MDT Lead is responsible for ensuring these patients are discussed at the MDT.

Referrals come from many sources (see Appendix i – Diagnostic, Treatment, Follow Up Pathways and Communication Framework). To try and ensure that all cases are referred the following steps may be taken:

- Copies of all 2 week wait referrals proved to have tumours on imaging will need to be sent to the MDT Coordinator.
- In case a Neuroscience or General Clinician suspects a brain tumour diagnosis the letter should also be copied to MDT Co-ordinator.
- Scan departments should notify the MDT co-ordinator of all NEW scanned patients noted to have tumours within the scope of this guidance (including metastases).
- Systemic Cancer MDTs will need to report all patients with brain metastases to the MDT Co-ordinator.

The MDT co-ordinator will record these referrals onto a database to ensure that all patients are captured. The database preferentially should allow web based access and robust methods of contact and cover to be established. This is partially available in our region.

To ensure all imaging is available in a timely fashion, the MDT Co-ordinator will need access to referring Hospital PACs systems, Patients Administration System and Electronic Patients Record. This is variably available in our region.
2.11 Primary Care Referral Guidelines

Appendix iv outlines the Primary Care referral guidelines & flowcharts. These guidelines are distributed via the PCT’s to General Practitioners and General Dental Practitioners. The Primary Care guidelines are also available as a separate document on the NEYHCA (Cancer) website. Please press control and click on the link:

http://www.hyccn.nhs.uk/NetworkGuidelinesAndPublications/bcns.htm

2.12 Secondary to Secondary Referral

For secondary to secondary referrals, e.g. NLGHFT to HEYHT or referral to another specialty – e.g. Lung, please contact the relevant MDT coordinator. In all instances the normal Inter Hospital Transfer (IHT) policy should be adhered to.

2.13 Secondary to Secondary Referral Follow Up

Follow up will normally be carried out by the referring hospital, but the nMDT / cMDT will discuss their recommendations with the referring clinician.

2.14 Sub specialisation

Within the Hull Royal Infirmary Neurosurgical Unit the Neurosurgeons have agreed to sub specialise to ensure that caseload and experience are sufficient to maintain a high quality service and referrals should follow these interests.
<table>
<thead>
<tr>
<th>Designation</th>
<th>Name</th>
<th>Contact</th>
<th>Subspecialty</th>
</tr>
</thead>
<tbody>
<tr>
<td>nMDT Lead Clinician Neurosurgeon</td>
<td>Shailendra Achawal</td>
<td>01482 607877</td>
<td>Glioma, Meningioma, Metastases</td>
</tr>
<tr>
<td>cMDT Lead Clinician</td>
<td>Mohan Hingorani</td>
<td>01482 461309</td>
<td>NA</td>
</tr>
<tr>
<td>Neurosurgeon</td>
<td>Chittoor Rajaraman</td>
<td>01482 607887</td>
<td>Glioma, Meningioma, Metastases</td>
</tr>
<tr>
<td>Neurosurgeon</td>
<td>Gerry O’Reilly</td>
<td>01482 605338</td>
<td>Glioma, Meningioma, Metastases, Paediatric tumours</td>
</tr>
<tr>
<td>Oncologists</td>
<td>Sanjay Dixit</td>
<td>01482 461303</td>
<td>NA</td>
</tr>
<tr>
<td>Neurologist</td>
<td>Anne Kunnacherry</td>
<td>01482 674438</td>
<td>NA</td>
</tr>
<tr>
<td>Clinical Nurse Specialists</td>
<td>Louise Baker</td>
<td>01482 607831</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Lynn Gill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neurosurgeon</td>
<td>Bruce Mathew</td>
<td>01482 604477</td>
<td>Anterior Skull Base Tumours, Pituitary Tumours, Pineal Region Tumours, Neuro-endoscopy</td>
</tr>
<tr>
<td>Neurosurgeon</td>
<td>Ashis Pathak</td>
<td>01482 607877</td>
<td>Pituitary tumours, skull base tumours</td>
</tr>
<tr>
<td>Maxillo facial Surgeon</td>
<td>Steve Crank</td>
<td>01482 674793</td>
<td>Anterior Skull base tumour, Reconstructive surgery</td>
</tr>
<tr>
<td>Neurosurgeon</td>
<td>Kevin Morris</td>
<td>01482 604329</td>
<td>Spinal tumours, Acoustic Neuromas</td>
</tr>
<tr>
<td>Neurosurgeon</td>
<td>George Spink</td>
<td>01482 604319</td>
<td>Spinal Tumours</td>
</tr>
<tr>
<td>Consultant Endocrinologist</td>
<td>Mo Aye</td>
<td>01482 675369</td>
<td>Endocrinologist Lead for Pituitary MDT</td>
</tr>
<tr>
<td>MDT Coordinator</td>
<td>Joanne Ward</td>
<td>01482 607841</td>
<td>Fax 01482 607892</td>
</tr>
</tbody>
</table>
3 Tumour Incidence & Management Overview

3.1 Tumour Types – a guide to the size of the problem in the NEYHCA (Cancer) Area

Intracranial Tumours are rare and the majority encountered will be Metastases. High Grade primary tumours, meningiomas, low grade primary tumours, pituitary and pineal region tumours and acoustic neuromas. Much of this guidance will feature these groups of tumours. The following figures are for year 2009-2010 (Figures provided from records in neuropathology department HEYHT 2010)

<table>
<thead>
<tr>
<th>Type</th>
<th>Incidence per 100,000</th>
<th>% Primary Tumours</th>
<th>Hull Neurosurgical Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuroepithelial Tumours</td>
<td>9</td>
<td>36 – 45%</td>
<td>47%</td>
</tr>
<tr>
<td>Meningeal Tumours</td>
<td>1.8</td>
<td>26 – 40%</td>
<td>22%</td>
</tr>
<tr>
<td>Pituitary Tumours</td>
<td>1.6</td>
<td>6 – 10%</td>
<td>16%</td>
</tr>
<tr>
<td>Pineal Region</td>
<td>0.08</td>
<td>0.3%</td>
<td>&lt;0.5%</td>
</tr>
<tr>
<td>Lymphocytic</td>
<td>1</td>
<td>1 – 3%</td>
<td>2%</td>
</tr>
<tr>
<td>Metastases</td>
<td>20</td>
<td></td>
<td>13%</td>
</tr>
</tbody>
</table>

Incidence, survival & mortality information. Brain & other parts of CNS – ICD – 10, C70 – C72 NYCRIS 2010

<table>
<thead>
<tr>
<th>Measure</th>
<th>England</th>
<th>NEYHCA</th>
<th>NHS Hull</th>
<th>NEL CTP</th>
<th>NHS NL</th>
<th>NHS NYY</th>
<th>NHS ERY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incidence ASR (2006 – 08)</td>
<td>7.0</td>
<td>6.5</td>
<td>7.0</td>
<td>6.7</td>
<td>7.3</td>
<td>7.5</td>
<td>6.5</td>
</tr>
<tr>
<td>Mortality ASR (2006 – 08)</td>
<td>5.0</td>
<td>5.0</td>
<td>5.3</td>
<td>5.6</td>
<td>5.4</td>
<td>5.1</td>
<td>4.5</td>
</tr>
<tr>
<td>One year relative survival (2003 – 07)</td>
<td>39.7</td>
<td>30.6</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Five year relative survival</td>
<td>21.5</td>
<td>15.4</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

3.2 Principles of Management

3.21 Communication

*Please also see Appendix i for the Communication Framework.*

Discussing the potential diagnosis of a brain tumour with a patient will always be shocking and communication is very important. Keeping the patient informed about the process and choices is paramount and should always be performed in a dignified and caring manner.

A summary of discussions should always be available in case notes & correspondence including evidence of discussion of the relative advantages and disadvantages of treatment against which
treatment decisions were made. If at all possible there should be equal disclosure to patients and relatives.

Following initial investigations and/or surgery, the clinician responsible for the patient should arrange to meet with the patient and their carers to discuss the findings of any investigations and histology results as appropriate.

The patients and their carers should be given written information about the diagnosis and treatment.

As well as definitive tumour treatment any treatment plan should include information about sources of Support, Rehabilitation, and Palliative care.

3.3 Principles of Diagnosis

3.31 Clinical

History, Examination, Investigation – consider as a differential diagnosis.

Tumours may present with headache, seizures, behavioural change or focal neurological symptoms and signs. Deficits are caused by pressure effects or cerebral invasion. Both can lead to CNS malfunction.

Initial referral guidance/Primary Care Referral Guidelines and Presentation pathway can be found in Appendix i & Appendix iv

3.32 Neuropathology

- Pathological specimens should be referred to the Neuropathology Unit, Hull Royal Infirmary, for diagnosis.
- Pathologists performing the diagnosis should participate in the EQA scheme administered by the British Neuropathological Society and should have documentary evidence. Please press control and click on the following link: http://www.bns.org.uk/
  Documentary evidence is available from HEYHT.
- The lead pathologists for the pathology of tumours of the nervous system and pituitary gland are Dr Samar Betmouni & Dr Robin Highley, Hull Royal Infirmary.
- Histological confirmation should be sought for every lesion. An intra-operative smear diagnostic service is available to guide intra-operative management and for diagnosis prior to the insertion of Gliadel® Wafers.
- Lesions are reported according to the WHO Guidelines for Tumours of the Central Nervous System. A list of recognised tumours is given in Appendix v.
- Guidance on the submission of specimens and minimum datasets for reporting are given in the standards issued by the Royal College of Pathologists. Please press control and click on the following links: http://www.rcpath.org
  The data collection policy is available from HEYHT.
- Difficult cases are referred to Professor James Lowe at Queen’s Medical Centre, Nottingham University Teaching Hospital NHS Trust, Nottingham.
- All tumours showing oligodendroglial differentiation are investigated for 1p;19q deletions by FISH analysis.

• PCR for MGMT status is available on request.
• Central nervous system lymphomas are referred to the Haematological Malignancy Diagnosis Service (HMDS) in Leeds for diagnostic confirmation and immunophenotyping.
  St James Institute of Oncology
  Level 3 Bexley Wing
  St James University Hospital
  Leeds LS9 7TF
  Telephone for General Enquiries: 01132067851
  Fax: 01132067883
  Contact email address www.hmds.org.uk.
  Please press control and click on the following link to the British Standards in Haematology: http://www.bcshguidelines.com/4_HAEMATOLOGY_GUIDELINES.html?dpage=1&sspage=0&ipage=0#gl

• Paediatric tumours of the central nervous system are reported following the guidelines produced by the Childrens Cancer & Leukaemia Group (CCLG). Please press control and click on the following link: http://www.cclg.org.uk/index.php
  Please also see the Childrens and TYA section of these guidelines.
• An autopsy service is available for all general and neuropathological cases including prion disease.
• Brains taken at autopsy can be referred to the Neuropathology Unit from any site within NEYHCA (Cancer) for neuropathological opinion. Please contact the laboratory 01482 607807 for further details.

### 3.33 Common Imaging Modalities

<table>
<thead>
<tr>
<th>Imaging Modality</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT Scanning</td>
<td>Screening test and bone involvement, image guided surgery</td>
</tr>
<tr>
<td>MRI Scanning</td>
<td>Diagnostic accuracy, anatomical localisation, image guided surgery and radiotherapy planning</td>
</tr>
<tr>
<td>Angiography</td>
<td>For vessel localisation and embolisation.</td>
</tr>
<tr>
<td>MRS Magnetic Resonance Spectroscopy</td>
<td>May help to distinguish primary from secondary, recurrence from radionecrosis, high grade from low grade</td>
</tr>
<tr>
<td>fMRI</td>
<td>Localise areas of important brain function for pre-operative planning</td>
</tr>
<tr>
<td>PET Scanning</td>
<td>May distinguish recurrence from radionecrosis</td>
</tr>
<tr>
<td>SPECT Single Photon Emission Tomography</td>
<td>May be used to try and distinguish, recurrence from Radionecrosis</td>
</tr>
</tbody>
</table>

For further imaging information please see the full Imaging Guidelines in Appendix vi.
3.34 Differential Diagnoses

Not all lesions initially considered tumours are tumours and the following important differential diagnoses should be considered.

- Haematoma
- Abscess
- Granuloma
- Parasitic Infections
- Vascular Malformations
- Multiple Sclerosis
- Infarcts
- Sarcoidsis

3.35 Corticosteroid Treatment

Often used for symptom relief and can have a predictive response for outcome.

Lowest possible dose necessary to control neurological symptoms should be used and this should be stopped if at all possible.

The patients should have written guidelines about the risks and benefits and dose reduction and should be monitored for long term side effects of steroids.

3.36 Surgical Treatment

Surgery should be designed to establish a diagnosis, cure the patient, decrease the tumour burden, relieve symptoms, improve neurological function and extend duration and quality of life.

Options are biopsy (usually image guided) and removal / debulking.

Specialist tools need to be available – neuronavigation, ultrasonic aspirator, cortical stimulator, microscope, endoscope.

Intraoperative pathology is required to confirm the adequacy of a diagnostic sample and to guide intra-operative management. It may also be used as one of the clinical criteria to decide whether or not to introduce Chemotherapy (Carmustine) wafers at the time of primary surgery.

Aggressive debulking surgery should be considered in patients with good prognostic factors such as younger age and good performance status and if the tumour mass is readily accessible.

Surgery provides rapid relief of symptoms of raised intracranial pressure and is relatively risk free in non-eloquent areas.

Surgical debulking is steroid sparing for subsequent radiotherapy and other treatments.

Consideration should be given to the use of Carmustine wafers in high grade glioma patients (after more than 90% resection).

Planned early post operative imaging for the extent of resection (up to 48 hours) should be considered to facilitate radiotherapy planning.
Decisions about extent of resection should be made in the nMDT with consideration of intraoperative adjunctive treatment.

DVT prophylaxis should be considered for all patients.

### 3.37 Radiotherapy Treatment

All patients should be considered for radiotherapy bearing in mind prognosis, performance status, and patient choice.

Patients need to be informed of the process including immobilization using a plastic face mask and the potential side effects especially fatigue and somnolence and hair loss.

The delay from surgery to radiotherapy should be kept to minimum and be no more than 4 weeks in patients with glioblastoma. For high grade glioma radiotherapy may be used as a part of a treatment plan in a therapeutic manner (60 Gray in 30 fractions to tumour bed and margin over 6 weeks); the alternative radical dose fractionation for elderly patients and patients with poorer performance status is 40 Gy/15 fraction. Palliative radiotherapy could be delivered at a dose of 30 Gy in 10 fractions over 2-weeks.

Radiotherapy planning for high grade glioma ideally should be based on preoperative/postoperative MRI T-1 contrast axial co-registered with planning CT- scan or contrast CT scan. The treatment volumes could be either:

1. Single phase 60 Gy in 30 fraction to 2-3cm around the T-1 contrast or CT- scan contrast and cavity
2. Two-phase plan with 54 Gy/ 27 fractions to 2 cm around the oedema for phase I and 6 Gy in 3 Fractions to 2cm around the T-1 contrast or CT contrast and cavity for phase II.

For organs at risk, like the Optic chiasm and optic nerve, a dose <54 Gy and <56 Gy respectively should be considered.

However these constraints could be ignored if there is significant underdosing of gross tumour. In this situation the risk of blindness or sight deterioration should be explained to the patient and carer and included in the consent.

For Low grade glioma: Radiotherapy dose is 50.4 to 54 Gy @ 1.8Gy per fraction given to T2 preoperative tumour with 1-2 cm margin.

Radiotherapy dose to Pituitary is 45 to 50.4 @ 1.8 Gy/fraction and to the craniopharyngioma 54Gy @1.8 Gy/fraction.

Clinical deterioration with worsening neurological status and increasing pressure symptoms 6-8 weeks following high dose radiotherapy may represent an early delayed radiation reaction and require careful follow up to distinguish from tumour recurrence.

Specialist radiotherapy e.g.SRS / SRT may be considered for some tumour types. The patients are referred to radiosurgery units in Sheffield or Leeds for stereotactic radiotherapy.
3.38 Chemotherapy

Specific indications for chemotherapy will be discussed with each tumour group.

Temozolomide should be given concomitantly with radiotherapy to eligible patients with Glioblastoma.

Nitrosourea may be given as single agent BCNU or CCNU or in triple therapy as PCV (Procarbazine, CCNU, and Vincristine) may be used as a second line chemotherapy.

Patients should be regularly monitored for the side effects of chemotherapy.

On recurrence in selected patients with Glioblastoma, Avastin is offered which is funded through Cancer Drug Fund (CDF).

3.39 Regimens

The most current regimen guidelines for Brain & CNS cancers can be found on the NEYHCA (Cancer) website. Please check you are using the most current version. Please press control and click on the links below:

http://www.hyccn.nhs.uk/NetworkGuidelinesAndPublications/ChemotherapyAndPharmacy.htm#CR

3.310 Treatment following Recurrence

If good response to primary treatment, good performance (KPS > 70) and good quality of life further treatment should always be considered.

Additional treatments may include further surgery and debulking for distressing pressure symptoms, additional radiotherapy treatments including at other specialist centres (SRS), LINAC based Stereotactic radiotherapy (SRT).

Patients should be considered for clinical trials of new treatment modalities.

3.4 Follow Up Clinics after Diagnosis

Most patients should be followed up in specialist joint clinics with the ability to involve other supportive staff as necessary.

In the neuroscience centre there are specialist clinics for pituitary patients and for other tumour patients.

The Pituitary clinic is served by the lead pituitary neurosurgeon, consultant endocrinologist and specialist endocrine and neuro-oncology nurses.

Monthly Neuro-oncology clinics are served by a consultant neurosurgeon, consultant oncologist and neuro-oncology specialist nurse.

Communication between team members is key and thorough documentation is required. This will be facilitated by the MDT process. Each patient will have a named key worker with clear contact arrangements.
There will be co-ordinated plans for discharge, return to community and rehabilitation.

Performance status and simple measures of quality of life at follow up will be collected for audit of treatment regimes (ECOG, Karnofsky – please see Appendix viii & Appendix ix.

As most patients will be managed in the community liaison with primary health and palliative care teams is key.

Follow up is described for each tumour type in the next chapter on Tumour Management. Supportive / Palliative Care is detailed further in the Neurorehabilitation Operational Policy

The Neurorehabilitation Operational Policy is available as a separate document and can be found on the NEYHCA (Cancer) website. Please press control and click on the following link: 
http://www.hyccn.nhs.uk/NetworkGuidelinesAndPublications/bcns.htm

Please also refer to the Brain & CNS Rehabilitation pathway for further information  
http://www.hyccn.nhs.uk/NetworkGuidelinesAndPublications/rehab.htm
4. Tumour Management

The number of tumours and appendages that involve the CNS is vast. Specific Evidence Based Management Guidance is not available for all tumour types.

Due to the rarity of some tumour types, up to date guidance will have to be determined at the time of presentation by literature review and consultation with National / International Experts.

Management Guidance will be presented for the more Common Tumours affecting the brain directly or indirectly.

- Primary CNS Tumours – High Grade and Low Grade
- Meningiomas
- Metastases
- Pituitary and Pituitary related tumours
- Skull Base Tumours

For each patient an individualised package of care is required considering clinical and psycho social factors.

4.1 Brain Tumours – Primary CNS Tumours

4.11 High Grade Glioma Primary Tumours (WHO Grades III & IV)

Glioblastoma, Glioblastoma with oligodendroglial component, Gliomatosis cerebri, Anaplastic Astrocytoma, Anaplastic Oligoastrocytoma, Anaplastic Oligodenroglioma, Anaplastic Ependymomas.

Factors Affecting Treatment Choice

- There is possible evidence for prolonged survival with resection extent.
- Radiotherapy improves survival.
- Conformal radiotherapy with tumour boost has fewer side effects (60 Gy maximum safe dose).
- Combination of Temozolomide and radiotherapy prolong survival in patients with Glioblastoma.
- Concomitant & adjuvant for 6 months Temozolamide with radiotherapy improve median survival by 2.5 months and 2 year survival by 16%.
- Carmustine wafers improve survival by 2 months in appropriate patients.
- Chemotherapy at recurrence improves survival for some tumours.
- Anaplastic oligodendrogliomas respond more frequently to chemotherapy than astrocytomas.
- Oligodendrogliomas with 1p/19q loss respond to chemotherapy and are associated with longer survival.
- Younger patients with good performance status, low comorbidity, lower grade tumour and seizures at presentation have a better prognosis.

Primary Treatment

- Palliative care in patients with poor performance status and patient above the age of 75.
- With multicentric unresectable tumour.
- Steroids for relief of raised Intracranial Pressure (ICP).
- Biopsy if deep seated or in eloquent area.
- Surgical de-bulking if accessible, considering using image guidance, fMRI.
• Consider Implantation of Carmustine Wafers if more than 90% resection is feasible.
• Radical radiotherapy – 6 weeks course of Radiotherapy.
• Concomitant daily Temozolamide with radiotherapy followed by adjuvant monthly 6 cycles as 5/28 schedule of Temozolamide with an interval scanning (for Grade IV glioma in patients younger than 70 years old)
• Possible palliative radiotherapy – 2-3 weeks course in patients with poorer performance status and older than 75 years old.

Protocol for the sequential use of per operative Gliadel and post operative concomitant radiotherapy and temozolomide:

Proposed recommendation
To monitor trend and toxicities of the sequential use of the two regimens, a national database may be generated. Audit of such a database would help in validating the putative notion of efficacy. A measure of an agreed guideline, protocol for risk management and audit of toxicities should be incorporated in the upcoming peer review of Neuro-oncology services.

A suggested guideline for the sequential use of Gliadel and ‘Stupp Protocol’:
• Patient: Younger ≤ 70 years, controlled diabetes, hypertension and other peripheral vascular diseases with performance status≤2.
• Tumour: Unifocal, ≥90% resectable without a large ventricle opening.
• Surgery: Water tight dural closure, use of dural patch (preferably autologous tissue) and biological glue to seal the ventricles.
• Medication: Prophylactic steroids, antibiotics and anticonvulsant.
• Chemotherapy: Completely healed surgical wound, no excessive brain oedema on postoperative MRI, acceptable full blood counts for Temozolomide.
• Communication: Patients should be explained about the risk of excessive myelotoxicities, risk of post surgical infection and oedema and lower level of evidence for efficacy.
• Team: Assigned to selected surgeons, involve oncologist before planning Gliadel in Multidisciplinary Team (MDT) meeting, dedicated nurse specialist for the postoperative care, close follow up and risk management.
• Audit: For toxicities and collection of data for the proposed national database.

Secondary Investigations
Genetic subtype analysis with loss of MGMT activity in GBM improves chemosensitivity. Chromosomal 1p;19q loss in oligodendroglioma improves chemosensitivity.

Follow Up
3 monthly MR scanning or as decided by the MDT in each case

Secondary Treatment Options at Relapse
Chemotherapy with PCV
Rechallenge Chemotherapy with Temozolamide
Avastin in patients with glioblastoma, recurred during adjuvant temozolomide having performance status<=2
Re-operation for mass effect or cyst drainage
Re-operation and implantation of Carmustine wafers
Further radiotherapy in selected patients

Relevant Clinical Trials
NBT (National Brain Tumour) an observational genetic epidemiological study in Glioma (in set up)
(Multi-centre, randomised, double-blind phase II study comparing cediranib (AZD2171) plus gefitinib (Iressa, ZD1839) with cediranib plus placebo in subjects with recurrent/progressive glioblastoma)

CATNON (BR14) Trial: RE: BR14 – EORTC 26053-22054 – Phase III trial on Concurrent and Adjuvant Temozolomide chemo in non-1p/19q deleted anaplastic glioma. The CATNON Intergroup trial

GALA

4.12 Low Grade Glioma Primary Tumours (WHO Grades I & II)

Factors Affecting Treatment Choice
Survival improved by resection if this can be performed safely
Radiotherapy improves survival
Early versus delayed radiotherapy increases the progression free survival but doesn’t increase in overall survival

Primary Treatment
Observation with MRI at regular interval
Biopsy or aggressive surgical resection
Radiotherapy – early or delayed
Chemotherapy – uncertain
Up to 40% of presumed low grade gliomas on scanning have features of HGG on histology
All tumours need a biopsy unless the risk is too high or biopsy is otherwise inappropriate
Poorer prognosis if: age >40, max. diameter > 6cm, with tumour across the midline, tumour is an astrocytoma rather than oligodendroglioma or mixed, and the patient has a neurological deficit

Secondary Investigations
Chromosomal 1p;19q loss in oligodendroglioma improves chemosensitivity

Follow Up
Early Baseline MR then 6 monthly or annual MR scanning and clinical review 2 weeks after scan

Secondary Treatment Options at Relapse
Chemotherapy with PCV
Chemotherapy with Temozolamide
Re-operation for mass effect or cyst drainage
If tumours transform, to manage as a high grade glioma

Relevant Clinical Trials: If available. NBT study.

4.13 Meningiomas & Hemangioblastoma

Factors affecting Treatment Choice
There are few randomised trials of best treatment but maximal safe resection is the best treatment option.
Radiotherapy can be used for atypical, anaplastic, recurrent and unresectable meningiomas.
It can also be used in unresectable, recurrent hemangioblastomas
Stereotactic Radio Surgery (SRS) can be used for small tumours
Primary Treatment
No treatment or observation with MRI at regular intervals
Resection – Total / Subtotal
SRS for deep seated small (< 3cms diameter) tumours
Conformal fractionated radiotherapy for larger deep seated tumours

Radiotherapy  If WHO grade is 2 or 3
There is invasion of adjacent brain or extensive invasion of other tissues
There is more than 1 relapse
There are contraindications to surgery
Consider: Age, symptoms, signs, performance status, site, size and patients’ preference

Secondary Investigations
None

Follow Up
To be decided by the MDT depending on the Grade of the tumour, imaging result, patient factors

Secondary Treatment at Relapse
Surgery
Radiotherapy including SRS
No established role for Chemotherapy

Relevant Clinical Trials: None available

4.14 Metastases

Factors Affecting Treatment Choice
Liaison with Primary Site MDT concerning prognosis and Performance Status
Consider quality and quantity of life issues.

Primary Treatment
Palliative care only
Biopsy / resection for unknown primary
Resection – Total / Subtotal if accessible and limited numbers / mass effect
SRS for deep seated small (< 3cm diameter) tumours if 3 or less metastases, with stable Extracranial disease and good performance
Radiotherapy – palliative, whole brain
Chemotherapy – dictated by Primary site MDT
Consider symptoms, signs, performance status, site, size, number

Secondary Investigations
Dictated by Primary Site MDT.
CT screening of Chest and Abdomen and other staging as required

Follow Up
For follow up the patients are referred back to the clinician managing primary cancer site like breast, lung etc.

Secondary Treatment at Relapse
Surgery
Radiotherapy including SRS
Chemotherapy – dictated by Primary site MDT
Relevant Clinical Trials:
Quartz: Radiotherapy or best supportive care in patients with brain metastases from the non small cell lung cancer

4.15 Pituitary and Pituitary related tumours
Patients will be managed in a separate specialist pituitary (Neuro-endocrine) MDT which would consist of a group involving neurosurgeons, endocrinologists, and neuro-oncologists, oncology nurses and endocrine nurses, and the pituitary MDT co-ordinator.

The MDT works to an operational policy. Please see flow diagram / operational policy below.

Factors Affecting Treatment Choice
Some tumours are hormone and drug sensitive may not require surgery
Visual changes may dictate the need for early surgery

Procedure for dealing with referrals

Primary Treatment
Consider symptoms, hormonal profile, visual fields
Observation
Hormonal or Drug Treatment
Resection – Total / Subtotal
Conformal fractionated radiotherapy or SRS

Secondary Investigations
Dictated by Pituitary MDT
Petrosal venous sampling
Follow Up
Early baseline MR scan at 3 months, then clinical review. 6 monthly or annual MR scanning as decided by the Pituitary MDT

Secondary Treatment at Relapse
Surgery
Radiotherapy including SRS

Relevant Clinical Trials If available

4.2 Other Less Common Tumours

4.21 Intradural Spinal Cord Tumours - Meningioma, Schwannoma, Astrocytoma, Metastasis

Factors Affecting Treatment Choice
Intramedullary tumours are very rare
May present as emergency with rapidly progressive paraparesis / quadriparesis

Primary Treatment
Observation
Extradural – Observation if asymptomatic or surgery depending on likely diagnosis from imaging
Intramedullary – Observation or surgery depending on symptoms, likely diagnosis and progression.
Radiotherapy rarely depending on imaging
Consider referral to a national Centre if these are established

Secondary Investigations
None

Follow Up
As decided by the MDT

Secondary Treatment at Relapse
Surgery
Radiotherapy

Relevant Clinical Trials
SCORAD III: 5 vs. 1 fraction radiotherapy for the metastatic spinal cord compression

4.22 Skull Base Tumours

Skull Base Meningiomas e.g. cavernous sinus, clivus, Vestibular Schwannomas, extension of head and neck cancer, Chordoma, Chondrosarcoma, tumour of head and neck, paranasal sinuses and metastases.

All Skull Base Tumours are discussed in the Skull Base / Neuro-Oncology MDT and appropriate treatment plans are suggested. Those requiring skull base neurosurgical procedure are operated upon at Hull by the Skull Base Surgery team which consists of Neurosurgeons, Maxillo-Facial Surgeons & ENT Surgeons.
For skull base tumours located in strategic locations or residual tumours after surgical excision the option of focussed radiation is discussed in the MDT and suitable patients are referred to National Centre for Stereotactic Radiosurgery at Sheffield for treatment using focussed radiation. Those who do not fall in the gambit of focussed radiation therapy are treated with conventional radiation therapy at Hull for further control of growth of the tumours.

The follow up of the patients after Sterotactic Radiosurgery is carried out at Hull through follow up clinic review and imaging.

Factors Affecting Treatment Choice
- Liaison with Primary Site MDT concerning prognosis and performance status for metastases
- Consider quality and quantity of life issues
- Involve other Specialist MDTs such as Skull Base MDT

Primary Treatment
- Palliative care
- Observation – watchful wait, depending on likely diagnosis
- Resection – Total / Subtotal, if necessary with multi-disciplinary surgical team
- SRS
- Conformal fractionated Radiotherapy
- Proton beam therapy
- Chemotherapy – dictated by Primary site MDT e.g. Head and Neck Cancer

Secondary Investigations
- Audiology
- Visual Fields
- Hormonal Assessment
- Check for Neurofibromatosis

Follow Up
- As decided by the MDT

Secondary Treatment at Relapse
- Surgery
- Radiotherapy including SRS
- Chemotherapy – dictated by Primary site MDT

Relevant Clinical Trials If available

4.23 Gamma Knife referrals to Sheffield

The National Centre for Stereotactic Radiosurgery is based at the Royal Hallamshire Hospital and provides 'Gamma Knife' radiosurgery treatments for a range of small tumours and vascular abnormalities within the brain.

The Royal Hallamshire Hospital sees and cares for patients with: Acoustic Neuroma, Meningioma, Arteriovenous Malformations, Pituitary Adenoma and a range of other less common intracranial conditions.

Stereotactic Radiosurgery is a highly specialised service and the Hallamshire Hospital is the largest of a small number of centres who offer this service in the UK.
Clinic days
Monday (am)
Tuesday (am) (pm)
Wednesday (am) (pm)

Addition information is available on the National Centre’s website www.gammaknife.org.uk

Consultants
Mr Andras A Kemeny Stereotactic Radiosurgery, Royal Hallamshire Hospital, 0114 2713572
Mr Matthias W R Radatz Stereotactic Radiosurgery, Royal Hallamshire Hospital, 0114 2713572
Mr Jeremy G Rowe Stereotactic Radiosurgery, Royal Hallamshire Hospital, 0114 2713572
Mr Lee Walton Radiosurgery Physics, Royal Hallamshire Hospital, 0114 2711783

Contact details
For more information about this service contact:
Telephone: 0114 2713572
Email: Gamma.Knife@sth.nhs.uk
Fax: 0114 2754930

National Centre for Stereotactic Radiosurgery Royal Hallamshire Hospital, Glossop Road, Sheffield, S10 2JF

4.24 Primary CNS Lymphoma

Factors Affecting Treatment Choice
If considered liaison with Haematology MDT concerning prognosis and performance status
Consider quality and quantity of life issues.

Primary Treatment
Palliative care
Image guided Biopsy
Resection – Total / Subtotal
Send a specimen to Neuropathology and HMDS in Leeds
Radiotherapy / Chemotherapy at the behest of the Haematology MDT

Secondary Investigations
Dictated by Primary Site MDT
Bone Marrow
CT screening of Chest and Abdomen and Pelvis

Follow Up
Once diagnosed the patients are referred to the Haematology MDT

Secondary Treatment
Dictated by Haematology MDT

Relevant Clinical Trials If available
4.25 Medulloblastoma (other Primitive neuroectodermal tumour) and embryonal tumour including penioblastoma – all Grade IV

Factors Affecting Treatment Choice
Mainly midline cerebellar tumour in children.
Refer to Paediatric Neurosurgical Unit in Leeds dependant on patients’ age (see Guidelines for Children, Teenagers & Young Adults Cancer)

Primary Treatment in Adults
Scan entire neuroaxis pre-op if possible.
Maximal safe resection with early post op neuro-axis imaging aiming for total resection if possible.
Cranio-spinal radiotherapy
Chemotherapy role: Debatable in adults
Shunt for hydrocephalus

Secondary Investigations
None

Follow Up
Early baseline MR then follow up at regular intervals
Paediatric and TYA are treated and followed up in Leeds

Secondary Treatment at Relapse
Re-resection
Chemotherapy

Relevant Clinical Trials If available

4.26 Pineal Tumours


Primary Treatment
CSF / Blood Tumour markers
CSF Cytology if possible
MR screening of whole neuraxis if biopsy / resection considered
Consider endoscopic biopsy
Shunting
Tailor treatment to likely tumour type: see following table

<table>
<thead>
<tr>
<th>Tumour Type</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meningioma</td>
<td>Surgery &amp; follow up</td>
</tr>
<tr>
<td>Mature Teratoma</td>
<td>Surgery &amp; follow up</td>
</tr>
<tr>
<td>Pineocytoma</td>
<td>Total resection &amp; follow up or, subtotal resection, focal radiotherapy &amp; follow up</td>
</tr>
<tr>
<td>Pineoblastoma</td>
<td>Surgery, Cranio-spinal radiotherapy and chemotherapy</td>
</tr>
<tr>
<td>Germinoma</td>
<td>Surgery &amp; radiotherapy (focal or entire neuraxis depending on leptomeningeal spread)</td>
</tr>
<tr>
<td>NGGCT</td>
<td>Surgery, chemotherapy and radiotherapy (focal or entire neuraxis depending on leptomeningeal spread)</td>
</tr>
</tbody>
</table>
Secondary Investigations
None

Follow Up
Early post op MR and then as per MDT discussion.

Secondary Treatment at Relapse
Surgery, Radiotherapy or Chemotherapy tailored to individual circumstances

Relevant Clinical Trials If available

4.27 Optic Pathway Gliomas

Factors Affecting Treatment Choice
Liaison with geneticist / Specialist Neurofibromatosis Service.
Refer to Paediatric / Adolescent Neuroscience MDT in Leeds

Primary Treatment
Observational treatment because of risk to visual pathways.
Resection – Total / Subtotal for pressure symptoms.
SRS/SRT
Radiotherapy

Secondary Investigations
Entire Neuraxis MRI.

Follow Up
6 monthly or annual MR scanning with clinical review.

Secondary Treatment at Relapse
Surgery
Radiotherapy including SRS

Relevant Clinical Trials If available
5. Radiotherapy, Chemotherapy & Supportive Therapies

5.1 Radiotherapy

Patients will be counselled about radiotherapy by the Neurosurgical and Oncological Teams. Written patients information should be provided.

When the patients has agreed to treatment they will be referred for Radiotherapy planning

5.11 Immobilization

Whole brain thermoplastic cast/Mould will be used for fractionated conformal radiotherapy.

5.12 Planning CT scan and co-registration

The tumour and target volume is contoured using either post contrast planning CT-Scan or preferably using Co-registered images of planning CT scan and pre-op MRI / post-op MRI.

5.13 Dose and Fractionation

For High grade glioma: 60 Gray in 30 fractions to tumour bed and margin over 6 weeks; Alternative radical dose fractionation for elderly patient and patient with poorer performance status is 40 Gy/15 fraction. Palliative radiotherapy could be 30 Gy in 10 fractions over 2-weeks.

Radiotherapy planning for high grade glioma ideally should be based on preoperative operative / post operative MRI T-1 contrast axial co-registered with planning CT- scan or contrast CT scan. The treatment volumes could be either

1. Single phase 60 Gy in 30 fraction to 2-3cm around the T-1 contrast or CT- scan contrast and cavity
2. Two-phase plan with 54 Gy / 27 fractions to 2 cm around the oedema for phase I and 6 Gy in 3 Fractions to 2cm around the T-1 contrast or CT contrast and cavity for phase II.

Organ at risk like Optic chisma dose <54 Gy and optic Nerve <56 Gy should be respected. However these constrains could be ignored if there is significant underdosing of gross tumour. In this situation the risk of blindness or sight deterioration should be explained to the patient and carer with taking appropriate consent.

For Low grade glioma: Radiotherapy dose is 50.4 to 54 Gy @ 1.8Gy per fraction given to T2 preoperative tumour with 1-2 cm margin.

Radiotherapy dose to Pituitary is 45 to 50.4 @ 1.8 Gy/fraction
Radiotherapy dose to Craniopharyngioma 54Gy @1.8 Gy/fraction.
Cranio-spinal radiotherapy: Cranio-spinal axi: 36 Gy/20-24 fractions and 18G/9 fraction to the post fossa (or primary tumour with a margin) boost.

Clinical deterioration with worsening neurological status and increasing pressure symptoms 6-8 weeks following high dose radiotherapy may represent an early delayed radiation reaction and require careful follow up to distinguish from tumour recurrence. Specialist radiotherapy e.g. SRS may be considered for some tumour types.
5.14 Common Side Effects of Radiotherapy and Management

The common side effects of treatment with the prognosis and possible treatments are summarised in the following table.

<table>
<thead>
<tr>
<th>Type</th>
<th>Time after DXT</th>
<th>Findings</th>
<th>Pathogenesis</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute</td>
<td>Immediate (minutes to hours)</td>
<td>Headache, vomiting, neurological signs</td>
<td>Raised ICP</td>
<td>Recovery (steroids)</td>
</tr>
<tr>
<td>Early Delayed</td>
<td>4 – 16 weeks</td>
<td>Somnolence, increased focal signs, worsening MR scan</td>
<td>Demyelination, possible oedema</td>
<td>Recovery (Steroids)</td>
</tr>
<tr>
<td>Late Delayed</td>
<td>Months to Years</td>
<td>Focal signs</td>
<td>Brain Necrosis</td>
<td>Steroids may improve</td>
</tr>
<tr>
<td>Necrosis</td>
<td>Months to Years</td>
<td>MR enhancement, memory loss</td>
<td>Vascular?</td>
<td>Steroids, surgical debulking for mass</td>
</tr>
<tr>
<td>Atrophy, Hydrocephalus</td>
<td>Months to Years</td>
<td>Dementia, gait ataxia, incontinence, MR atrophy, hydrocephalus, leukoencephalopathy</td>
<td>Cell loss, demyelination, white matter spongiosis</td>
<td>Shunting?</td>
</tr>
<tr>
<td>Haemorrhage</td>
<td>Years</td>
<td>Focal signs</td>
<td>Telangiectasia</td>
<td>Partial recovery</td>
</tr>
<tr>
<td>Infarction</td>
<td>Years</td>
<td>Focal signs</td>
<td>Cerebral / carotid atherosclerosis</td>
<td>Variable</td>
</tr>
<tr>
<td>Encephalopathy</td>
<td>Years</td>
<td>Confusion/ disorientation</td>
<td>Hypothyroidism</td>
<td>Recovery with Thyroxine Replacement</td>
</tr>
<tr>
<td>Neoplasm</td>
<td>Years</td>
<td>Focal Signs</td>
<td>XRT induced neoplasm</td>
<td>Poor</td>
</tr>
</tbody>
</table>

5.15 Conventional and Experimental Radiotherapy Treatments

Conformal radiotherapy, Stereotactic radiotherapy (Gamma knife, LINAC fractionated), Intensity Modulated Radiation Therapy (IMRT) and Interstitial Radiotherapy are all considered standard treatments for various Brain and other CNS related tumours.

For Proton beam radiotherapy referral guideline and proforma please see Appendix x.
### 5.16 Treatment Planning – Clinical Protocol (TP-CP-67)

Revision 3 Replacing TP-CP-67(1) / TP-CP-68(1) / Process Owner: P Colley / Document Author: S Dixit

<table>
<thead>
<tr>
<th>Site</th>
<th>Brain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage / Clinical Indications Intent</td>
<td>Reirradiation of High grade glioma Radical</td>
</tr>
<tr>
<td>Lead Clinicians / Clinical Responsibility</td>
<td>S. Dixit M. Hingorani</td>
</tr>
<tr>
<td>Review Date</td>
<td>Must be annual review date.</td>
</tr>
<tr>
<td>Booking Schedule</td>
<td>To book the CT-Planning scan after the clinic consultation and taking consent.</td>
</tr>
<tr>
<td>Technique (Summary)</td>
<td>3D conformal / IMRT</td>
</tr>
<tr>
<td>Localisation Technique</td>
<td>CT with contrast or MRI Fusion with most recent MRI.</td>
</tr>
<tr>
<td>Patient Position</td>
<td>Supine with head neutral, head Flex in temporal lobe tumour, Preferably prone in post fossa location.</td>
</tr>
<tr>
<td>Immobilisation Technique</td>
<td>Thermoplastic mask and appropriate head rest.</td>
</tr>
<tr>
<td>Planning Technique</td>
<td>As per departmental protocol TP-PRT-1.</td>
</tr>
<tr>
<td>Total Dose at ICRU reference point and Number of Fractions (or if alternative reference point please state)</td>
<td>40Gy in 20 fractions.</td>
</tr>
<tr>
<td>Overall Treatment Time (Days)</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Energy / Modality</td>
<td>6 / 15 MV</td>
</tr>
<tr>
<td>Number of Phases Dose and Fractions per phase</td>
<td>One -phase 40Gy in 20 fractions</td>
</tr>
</tbody>
</table>
### Target Definition per phase

- **GTV**: Tumour cavity and enhancing lesion preop/post op MRI.
- **CTV**: 1 cm around GTV editing along the anatomical barriers and boundaries and route of spread.
- **PTV**: 3 to 5 mm around CTV without editing along the anatomical barriers and boundaries.

### OAR and Constraints

<table>
<thead>
<tr>
<th>Dose / Target</th>
<th>2GyNTD</th>
<th>BED₂ (Gy)</th>
<th>BED₁₀(Gy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior RT</td>
<td>60Gy/30 Fr.</td>
<td>120</td>
<td>72</td>
</tr>
<tr>
<td>Reirradiation PTV</td>
<td>40Gy/20 fr.</td>
<td>80</td>
<td>48</td>
</tr>
<tr>
<td>Cumulative</td>
<td>100Gy</td>
<td>200</td>
<td>120</td>
</tr>
<tr>
<td>Cumulative Pons Medulla</td>
<td>54 Gy∞</td>
<td>108</td>
<td></td>
</tr>
<tr>
<td>Cumulative Chiasma</td>
<td>60 Gy</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Cumulative Optic nerve</td>
<td>60 Gy*</td>
<td>120</td>
<td></td>
</tr>
</tbody>
</table>

- * One nerve could have cumulative 64Gy
- ∞ the surface could receive 60 Gy

### Treatment Verification

As per departmental protocol TV-PRT-1.

### Re-treatment Conditions

- **Dose / Fractionation / Timescales**: It is a retreatment.
  - Interval from previous irradiation: >2 years.
  - Tumour volume: PTV not involving more than two ipsilateral lobe.
    - Previous radiation BED₂ <=120Gy;
      - 2Gy equivalent<=60Gy/30 fractions over 6 weeks.
    - Cumulative BED₂ <=210 Gy;
      - -2Gy equivalent <=40Gy/20 fractions= BED2= 80

### Clinical References

   

5.2 Chemotherapy
5.21 Chemotherapy Treatment Algorithm for Brain & CNS Cancer

Brain & Other CNS Tumours

Glioblastoma
- Newly diagnosed GBM
- Temozolomide 75mg/m² & RT for 6 weeks
  - Recurrence within 6mths or during
  - Temozolomide 150-200mg/m² for 5 day every 28days for 6 months (Adjuvant Treatment)
- Recurrence after 6mths
- Recurrence after 6mths
- Recurrence within 6mths or during
  - (PCV) Lomustine, Procarbazine & Vincristine
  - PD
- Bevacizumab (CDF Funded)

GIII Astrocytoma
- Recurrence
- Recurrence after 6mths
- Recurrence

Oligodendroglioma
- Grade II
- Recurrence
- Recurrence Post Radiotherapy large volume 1p 19q deleted
- 1st line (large tumour with 1p 19q deletion
- PD

Ependymoma
- Grade III
- Recurrence

Medulloblastoma & Adult PNET
- Adjuvant treatment
- Carboplatin & Etoposide
- Single agent Carboplatin or Etoposide
- Adult <40 high risk with CSF

Newly diagnosed GBM
- Temozolomide
- 75mg/m² & RT for 6 weeks
- Recurrence
- Recurrence after 6mths
- Recurrence

Recurrence after
6mths

Recurrence

Lomustine, Cisplatin & Vincristine
- Recurrence
- Lomustine, Cisplatin & Vincristine

Lomustine, Cisplatin & Vincristine
- Recurrence

Palliative Care
5.22 Drug Regimes

All most current, approved and commissioned chemotherapy regimens can be found on the NEYHCA (Cancer) website. Please check you are using the most current version. Please press control and click on the link below:

http://www.hyccn.nhs.uk/NetworkGuidelinesAndPublications/ChemotherapyAndPharmacy.htm#CR

Temozolomide for Grade IV Glioma: concomitant with radiotherapy and then adjuvant for 6 months.

For recurrence of high grade glioma: No prior Temozolomide or Temozolomide exposure more than 6 months ago: Temozolomide.
<6 month since temozolomide exposure: PCV or Bevacizumab through Cancer Drug Fund.

5.23 Risks of Treatment

Most risks of chemotherapy are related to myelosuppression especially anaemia and risk of infection.

Any possible infection must be treated early and aggressively.

Because of the risk of Pneumocytis pneumonia during concomitant XRT and Temozolamide administration, prophylaxis should be considered.

Each drug group has specific risks e.g. Nitrosoureas – pulmonary fibrosis, Procarbazine – encephalopathy & peripheral neuropathy, Vincristine – Peripheral and Central Neuropathies.

Consideration should be given to patient age, concomitant illnesses and in particular renal function.

All patients are likely to require anti emetics.

5.24 CCNU

Lomustine (CCNU)  130 mg/m² every 6 weeks at BEDTIME. This time interval may need to be modified with repeated courses

5.25 Modified PCV

Treatment

<table>
<thead>
<tr>
<th>Day</th>
<th>Drug</th>
<th>Dose</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vincristine</td>
<td>1.4 mg/m² (see below for maximum cap dose)</td>
<td>in 50 mL NS over 5-15 mins</td>
</tr>
<tr>
<td>1</td>
<td>Lomustine (CCNU)</td>
<td>110 mg/m² at bedtime</td>
<td>PO</td>
</tr>
<tr>
<td>2 -15</td>
<td>Procarbazine</td>
<td>60 mg/m² /day, days 2-15</td>
<td>PO</td>
</tr>
<tr>
<td>22</td>
<td>Vincristine</td>
<td>1.4 mg/m² (see below for maximum cap dose)*</td>
<td>in 50 mL NS over 5-15 mins</td>
</tr>
</tbody>
</table>
5.26 Temozolamide

Should be used as concomitant treatment with XRT at 75mg/m$^2$ followed by a monotherapy phase of treatment. The dose for Cycle 1 is reduced to 150 mg/m$^2$ for 5 days with 23 days off treatment followed by 200 mg/m$^2$ for 5 days then 23 days off treatment from Cycle 2 onwards 6 cycle in total.

5.27 For Recurrent Ependymoma

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>BCCA Administration Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carboplatin</td>
<td>300 mg/m$^2$ on day 1</td>
<td>IV in 250 mL D5W over 30 min</td>
</tr>
<tr>
<td>Etoposide</td>
<td>100 mg/m$^2$ on day 1</td>
<td>IV in 500 mL NS over 30-60 min (use non-PVC equipment)</td>
</tr>
</tbody>
</table>

5.3 Steroids

Dexamethasone is the most commonly used corticosteroid, at a dose of up to 16 mgs daily. It is long acting and can be given b.d. to reduce side effects. It should be given no later than 1800 hours in order to avoid causing insomnia.

Dexamethasone has many advantages. It controls neurological symptoms by reducing oedema, it decreases radiotherapy induced toxicity, it relieves chemotherapy induced nausea and is oncolytic in lymphoma.

Unfortunately it also has many disadvantages and side effects including a reduction in chemotherapy penetration and oncolysis in lymphoma can make treatment difficult.

Common side effects are summarised in the following table:

<table>
<thead>
<tr>
<th>Common (Mild)</th>
<th>Non neurological (Serious)</th>
<th>Neurological (common)</th>
<th>Neurological (uncommon)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insomnia</td>
<td>GI bleeding</td>
<td>Myopathy</td>
<td>Psychosis</td>
</tr>
<tr>
<td>Bloating</td>
<td>Bowel perforation</td>
<td>Behavioural change</td>
<td>Paraparesis</td>
</tr>
<tr>
<td>Appetite</td>
<td>Osteoporosis</td>
<td>Hallucinations</td>
<td></td>
</tr>
<tr>
<td>Visual Blurring</td>
<td>Avascular necrosis (hip)</td>
<td>Hiccoughs</td>
<td></td>
</tr>
<tr>
<td>Urinary Frequency and nocturia.</td>
<td>Glaucoma</td>
<td>Tremor</td>
<td></td>
</tr>
<tr>
<td>Acne</td>
<td>Opportunistic infections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oedema</td>
<td>Hyperglycaemia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lipomatosis</td>
<td>Pancreatitis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Candidiasis</td>
<td>Infection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory loss</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.31 Dose Reduction

- Patients should be managed on the minimum dose possible to reduce the risk of side effects.
- Because of the risk of adrenal suppression treatment should not be stopped abruptly.
- Treatment should be reduced following surgical debulking or radiotherapy treatment to the lowest dose possible that controls in patient’s symptoms. There are several factors that affect the speed with which this can be done, including what treatment the patient has just undergone. Steroid therapy should be increased if symptoms recur.
- If the patient becomes unwell after dose reduction this should be increased to the previous level and reduced more slowly.
- Patients and carers should be given written advice about steroid reduction.
6. Children, Teenagers & Young Adults

6.1 IOG Key Principles

Who does this apply to?

- All patients aged 16-24 with cancer
- (2 age groups 16-18 years and 19-24 years)

What needs to happen?

- All patients aged 16-18 years inclusive should be referred to a Principal Treatment Centre (Young People) for treatment
- All patients aged 19-24 years inclusive should be offered referral to a Principal Treatment Centre (Young People) for treatment.
- All patients aged 16-24 years inclusive should be discussed at both a site-specific MDT meeting and a TYA MDT meeting.
- Referral of patients to a PTC (Young People), or review by both a site-specific and a TYA MDT should not be allowed to delay the start of urgent cancer treatment.
- For each patient, a lead medical clinician should be identified, who will have overall responsibility for their treatment.

Ref: Children & Young People’s Improving Outcomes Guidance - Implementation - August 2008

Why?

- The 2005 NICE IOG on Children and Young People mandates this model of decision-making and care (key principles)
- These young people have particular needs in terms of communication, supportive care and environment of care, that are best served by referral
- The particular spectrum of diseases between MDTs
- This is what young people want to happen, when asked

When does referral need to happen?

- As soon as you are aware of (or have a high suspicion of) a diagnosis of cancer & in time for the TYA team to be involved in decisions about pattern and place of care i.e. before the management plan is negotiated with the patient.

How is this referral made?

- Referral to be made using process agreed in the Standard Operating Procedure (Set up in conjunction with the Yorkshire Cancer Network)

6.2 Standard Operating Procedure

To view a copy of the Standard Operating Procedure please check the NEYHCA (Cancer) website. Please press control and click on the following link

http://www.hyccn.nhs.uk/NetworkGuidelinesAndPublications/CYA.htm
6.3 Pathway for Children & Young People with Cancer V2 (YCN & NEYHCA (Cancer) / HYCCN)

Yorkshire and Humber Children and Young People’s Cancer Network
Pathway for Children with Central Nervous System Tumours <16 years of age
V2 (November 2011)

**Criteria 1**
Urgent referrals are usually made by phone call or fax followed up with a letter

**Criteria 2**
For extracranial solid tumours all suspicious or unusual pathology for <15s, should be referred to neuro pathology for specialist review immediately and within 5 days. Diagnosis made and/or confirmed by PTC.

**Criteria 3**
All patients to be reviewed at PTC MDT, including pathology and imaging review.

**Criteria 4**
Communication from PTC to referring clinician and GP informing of diagnosis and treatment plan.

**Criteria 5**
Those who are long-term inpatients – monthly update. Those who are discharged – discharge summary within 3 weeks.

**Criteria 6**
Shared care provided in accordance with YCN protocols.
### 6.4 Pathway for Teenagers & Young Adults with Cancer V1.0 (YCN & NEYHCA (Cancer) / HYCCN)

<table>
<thead>
<tr>
<th>Maximum timeline in days</th>
<th>YCN &amp; HYCCN Teenage and Young Adult with Cancer Pathway 16-24 Version 1.0 (November 2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Urgent referral GP/Screening</td>
</tr>
<tr>
<td>14</td>
<td>First seen Diagnostic investigations</td>
</tr>
<tr>
<td>21</td>
<td>Cancer diagnosis Or when highly suspicious Patient may be informed of diagnosis TYA Service involvement</td>
</tr>
<tr>
<td>28</td>
<td>Review at local site specific MDT Refer to TYA MDT Refer to Specialist Site Specific MDT if required TYA Service involvement</td>
</tr>
<tr>
<td>35</td>
<td>Communication and administrative processes TYA MDT referral request protocol to be completed by local MDT and sent to the central point Communication between MDTs and centre TYA Service involvement</td>
</tr>
<tr>
<td>62</td>
<td>Process following the TYA MDT/Specialist Site Specific MDT Review Referring clinician informed of outcome of review Liaison between the TYA MDT and the Specialist Site Specific MDT Further investigations arranged, if required TYA Service involvement</td>
</tr>
<tr>
<td></td>
<td>Patient choices/joint consultations/place of care Patient and carer, TYA Team representative, Lead Clinician TYA Service involvement Decision to Treat, Lead Clinician identified</td>
</tr>
<tr>
<td></td>
<td>PTC Care – treatment and ongoing care</td>
</tr>
<tr>
<td></td>
<td>PTC definitive treatment – then shared care</td>
</tr>
<tr>
<td></td>
<td>Local treatment with TYA outreach support</td>
</tr>
<tr>
<td></td>
<td>Local treatment with no TYA outreach support</td>
</tr>
<tr>
<td></td>
<td>First definitive treatment</td>
</tr>
<tr>
<td></td>
<td>MDT Follow up/further assessment</td>
</tr>
<tr>
<td></td>
<td>Subsequent treatments Within 31 days of first treatment</td>
</tr>
<tr>
<td></td>
<td>Follow up</td>
</tr>
<tr>
<td></td>
<td>Living with cancer End of life care</td>
</tr>
</tbody>
</table>

The TYA MDT alert/Referral request is to inform the TYA PTC team that a patient or referring clinician may require advice or input from a member of the TYA team. To request a full TYA MDT review at a future point in the pathway to request that a member of the TYA be present at the patient choice/treatment options discussion. The alert can be instigated by an MDT co-ordinator, a CNS, or the investigating clinician. The TYA MDT alert is sent to a central point.

Review date: November 2010
7. Audit & Research

7.1 Audit

Audit is a key part of improving patient care.

The minimum progress needed for the CEG's compliance with the measures is that the CEG, in consultation with the MDTs, agrees at least one audit project with the Cancer Management Group, with any necessary sources of funding agreed with commissioners or from elsewhere.

The individual MDTs, for compliance with the measures, should agree to participate in the audit. The MDT should annually review the progress of the project or present the results of the completed audit project to the CEG for discussion at one of their meetings.

All members of the multidisciplinary teams should attend regular audit meetings.

The Manual for Cancer Services states that cancer sites which have standards based on Improving Outcomes Guidance (IOG), the parameters to be audited should be drawn from the “Measurement” sections of the relevant IOG.

The group should consider auditing practice against NEYHCA (Cancer) guidance and other National cancer guidelines as they are published.

7.2 Nationally Co-ordinated Research

Research within the NEYHCA (Cancer) is co-ordinated by Srdjan Ljubojevic, Cancer Research Network Manager.

Humber & Yorkshire Coast Cancer Research Network (HYCCRN)
Sledmere House
Willerby Hill Business Park
Beverley Road
Willerby
HU10 6ED
Phone: 01482 336270
Fax: 01482 336288

The Clinical lead for the HYCCRN is Dr Anthony Maraveyas, Consultant Oncologist.

The Research Network Manager will notify the MDT of trials which are within the NCRN portfolio, both ongoing and new. This will include most non-commercial phase III - IV clinical trials, NCRN approved commercial trials and some phase II studies.

A Subgroup of the Society of British Neurosurgeons has been formed under the chairmanship of Garth Cruickshank (g.s.cruickshank@bham.ac.uk), Professor of Neurosurgery, Queen Elizabeth Hospital, Birmingham tasked to developing Academic Neurosurgery in the UK. This group is particularly aimed at Tumour research and is affiliated to the National Cancer Research Institute (http://www.ncri.org.uk).
7.3 Local Research

NEYHCA (Cancer) is committed to high quality research. The number of clinical trials for patients with Brain & CNS cancers are low, but when trials are available suitable patients will be entered into the trials

- Brain and other CNS related tumours remain formidable treatment challenges and treatments can only improve with research. All patients managed by the Brain & CNS MDTs should be considered for both local and national research studies.

- Specialist Centre / Localities should be encouraged to participate in surgical and non-surgical randomised controlled trials, particularly national trials. Primary Care Trusts should endeavour to secure the provision of additional resources needed to participate in clinical trials.

- The CEG should regularly receive reports regarding accrual of patients into trials and at least annually should receive and discuss a report from each of the MDTs in response to the CEG approved trials list.

- Any remedial actions required following these reports should be agreed by the CEG, MDT and the Clinical Lead for the Research Network.

- There should be a single list of clinical trials and/or studies into which the MDTs should give priority for patient entry.

- Each MDT should nominate a named member responsible for ensuring that recruitment into trials / research is integrated into the function of the MDT.

- The MDT must provide a written response to the CEG clinical trials list & agree to carry out recruitment and remedial actions to assist recruitment.

- A minimum dataset and collection policy should be agreed across NEYHCA (Cancer)

- The dataset should collected in an electronically retrievable form

- A data manager/MDT Co-ordinator should be employed to collect the agreed minimum dataset. A record of all patients with known or suspected Brain & CNS cancers should be kept. All patients with known or suspected Brain & CNS cancers should have details recorded.

7.4 Minimum Dataset & Collection Policy

A minimum dataset and collection policy has been agreed across NEYHCA (Cancer). The Brain & CNS CEG endorses the NEYHCA (Cancer) policy for cancer data collection and storage.

- All data items should be collected at the most appropriate point on the patient pathway.

- Provider Trust to agree locally the most appropriate personnel and systems for the collection and storage of the agreed minimum dataset.

- Collection of clinical data items will be supported by appropriate clinical input from core members of the MDT.
• Provider Trusts are responsible for the collection, storage and upload of data items in the Going Further on Cancer Waiting Times dataset.

• Action plans to be developed between NYCRIS and Acute Trust to determine the transition process between 2008 and 2011 for the collection and electronic submission of the cancer registry dataset.

• Data items should be stored appropriate an electronic format to allow upload into approved national systems and databases.

• Storage and transfer of patient identifiable information should adhere to all relevant National guidance and local Trust policies.

• Full details of the key points in this policy should be specified in the MDT key documents.

A Data Manager / MDT Co-ordinator has been employed to collect the agreed NEYHCA (Cancer) minimum dataset in agreement with the NEYHCA (Cancer) MDS collection policy. A record of all patients with known or suspected Brain & other CNS Tumours should be kept.

The CEG has agreed a policy with the MDTs specifying common priorities for data collection in line with national priorities e.g. cancer waiting times.

This policy is specified in the MDTs key documents.

• Which type of team should collect which portion of the MDS.

• When each data item should be captured on the patient pathway.

• How the data will be stored and managed within all appropriate local data systems.
8. References

Please press control and click on the links below


5. Carmustine implants and Temozolamide for the treatment of newly diagnosed high-grade glioma. NICE Technology appraisal guidance 121, June 2007 www.nice.org.uk/ta121


Appendices

Appendix (i) Diagnostic, Treatment, Follow Up Pathways and Communication Framework

Presentation pathway – see also Primary Care guidelines in Appendix (iv)
Diagnostic pathway

In the majority of cases, Brain & CNS cancer patients present to a hospital rather than referred by a GP. The Imaging is performed in the hospital where the patients first present. A suspected Brain tumour based on this imaging is referred to the neurosciences MDT, hence this referral pathway covers a major part of the diagnostic pathway. Within NEYHCA (Cancer) there is a direct access to imaging systems for SNEYHT, York & NLGHFT in Hull Royal Infirmary where the nMDT is held.

Process of Investigation to Confirm Diagnosis

Patient presents to Trust (2ww / acute presentation)

- HEYHT Imaging
- NLGHFT Imaging
- York Imaging
- SNEYHT Imaging

Biopsy or surgery** (neurosurgical / ENT / maxillofacial)

Neuropathology**

Suspected Lymphoma

HMDS Leeds

Imaging* sent to nMDT / cMDT, for Brain & Other CNS Cancers, Skull Base, Spine

Referral pathway & contact points can be found in the main body of the guidelines

Specialised imaging (e.g. MRS, fMRI)

Diagnosis of cerebral metastases

Other specialised MDT e.g. Breast MDT / Lung MDT
Treatment Pathway for Primary & Recurrent Disease

Delivery of Active Treatment – Radical and / or Palliative

- Diagnosis of new tumour / recurrence / metastasis
- Diagnosis of brain metastasis in other organ specific MDT (e.g. breast, lung)
- Neurosurgery clinic / joint neuro oncology clinic

- Pituitary MDT
- Endocrinologist
- Oncologist
- Neurosurgery
- Excision / Biopsy
- Radiotherapy / Chemotherapy
- Neuropathology
- Gamma Knife referrals to Sheffield

See guidelines section 4.23

Leeds, NCG Proton
See guidelines Appendix ix

AHP, Supportive Care, Palliative Care, Rehabilitation
Communication Framework

Imaging Clinician
(All Trusts within NEYHCA (Cancer) and York)

Diagnosis of brain, skull base, spine, pituitary, other CNS tumour

- Patient logged onto the nMDT database within 1 week of the image report (to be included in the Service Level Agreement)
- Sends clinical summary to nMDT within 2 working days of diagnosis

nMDT / cMDT
- Written summary of proposed management plan sent to referring clinician / GP within one working day of nMDT meeting confirming diagnosis
- Inpatients / carers to be informed of diagnosis, identity & role of key worker & management plan within 1 working day of nMDT meeting confirming diagnosis
- Outpatient / carers to be informed of diagnosis, identity & role of key worker & management plan within 5 working days of nMDT
- Patient referred, where necessary, to rehabilitation / palliative care service within 1 working day of the decision being made
- all Neurosurgical interventions take place in Neurosurgery department at Hull Royal Infirmary by nMDT member hence discharge from Neurosurgery is known to cMDT

Multidisciplinary Clinic
- Refer back to nMDT for further management of possible recurrence within 1 working day of the decision
# Appendix (ii) Brain Tumour 2 Week Wait Referral Proforma

## HIGH RISK OF CANCER

**REFERRAL TO THE NEUROLOGY DEPARTMENT FOR SUSPECTED BRAIN CANCER**

PLEASE COMPLETE ALL SECTIONS AND FAX TO **01482 675505**

THE CENTRAL REFERRAL POINT TELEPHONE NUMBER IS 01482 604308

<table>
<thead>
<tr>
<th>PATIENT DETAILS</th>
<th>GP DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
<td>Name:</td>
</tr>
<tr>
<td>D.O.B.</td>
<td></td>
</tr>
<tr>
<td>Address:</td>
<td>Address:</td>
</tr>
<tr>
<td>Post Code:</td>
<td>Post Code:</td>
</tr>
<tr>
<td>Tel No:</td>
<td>Tel No:</td>
</tr>
<tr>
<td>Hospital No.</td>
<td>Contact No: (Direct line of person booking ie GP/Secretary/Receptionist)</td>
</tr>
<tr>
<td>NHS No:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Is patient instructed to self book?</th>
<th>Y / N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact No.</td>
<td>Contact Time:</td>
</tr>
<tr>
<td>Is Language Line needed?</td>
<td>Y / N</td>
</tr>
<tr>
<td></td>
<td>Language:</td>
</tr>
</tbody>
</table>

**IS THE PATIENT AWARE OF THE POTENTIAL DIAGNOSIS?**  Y / N

Has this patient been seen before by a Neurologist?  Y / N

Name of Consultant ........................................................ Date seen: ........../........../.......

HISTORY

Yes  No
PATIENTS NAME........................................HOSPITAL NUMBER........................................

Rapidly progressive focal deficit
- Weakness/heaviness/clumsiness
- Unsteadiness
- Numbness/tingling
- Deafness in one ear
- Visual disturbance

SEIZURES
- Focal onset
- Post-ictal deficit
- Associated (inter-ictal) focal deficit
- De novo status epilepticus

RAISED INTRACRANIAL PRESSURE
- Headache
- Nausea/vomiting
- Double vision
- Intermittent drowsiness

MENTAL STATE CHANGES
- Short history cognitive decline (e.g. memory loss)
- Short history behavior/personality change

EXAMINATION FINDINGS
Higher mental functions
- Alert
- Oriented
- Attentive
- Forgetful
- Dysphasic

Cranial nerves
- Papilloedema
- Extracocular muscle palsy
- Visual field loss
- Facial weakness
- Unilateral deafness

Limbs
- Ataxia
- Hemiparesis
- Hemisensory Loss

MEDICAL HISTORY/DRUGS/ALLERGIES/ANY OTHER COMMENTS:

Signature of G.P.......................................................... Date of Referral: ......../........./........
Appendix (iii) nMDT / cMDT Referral Form

Department of Neurosurgery
Every Acute Referral must be discussed with the On-call Neurosurgical Registrar

Referral FORM to the Brain/CNS MDT @ HRI

<table>
<thead>
<tr>
<th>REFERRER DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of referrer, ward and hospital</td>
</tr>
<tr>
<td>Consultant &amp; Speciality</td>
</tr>
<tr>
<td>Date of referral</td>
</tr>
<tr>
<td>Referrer’s contact details (required to provide feedback)</td>
</tr>
<tr>
<td>Phone No</td>
</tr>
<tr>
<td>Fax No</td>
</tr>
<tr>
<td>Email</td>
</tr>
</tbody>
</table>

| Neurosurgeon referred to & |
| Neurosurgical Registrar on call |

<table>
<thead>
<tr>
<th>CLINICAL DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Name (forename, surname)</td>
</tr>
<tr>
<td>Date of birth and age</td>
</tr>
<tr>
<td>NHS Number/HEY Number (obligatory)</td>
</tr>
<tr>
<td>Location of patient</td>
</tr>
<tr>
<td>Primary/Secondary or Unknown</td>
</tr>
<tr>
<td>If secondary tumour then:</td>
</tr>
<tr>
<td>Name of oncologist dealing with primary - Dr</td>
</tr>
<tr>
<td>Prognosis for primary (include median survival)</td>
</tr>
<tr>
<td>Imaging on (tick as appropriate)</td>
</tr>
<tr>
<td>NLAG PACS</td>
</tr>
<tr>
<td>Date of imaging</td>
</tr>
<tr>
<td>History of Presenting Illness:-</td>
</tr>
<tr>
<td>Past History/ Medications:-</td>
</tr>
<tr>
<td>Right/Left handed :-</td>
</tr>
<tr>
<td>Neurological Status :-</td>
</tr>
<tr>
<td>Patient’s wishes/concerns/views (if known) :-</td>
</tr>
<tr>
<td>WHO Performance status (tick appropriate box)</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

Please send to:
Jo Ward, Brain/CNS MDT Administrator, 6th Floor Staff Residents, Hull Royal Infirmary, Anlaby Road, Hull, East Yorkshire, HU3 2JZ.
Tel: 01482 607841, Fax: 01482 607852.
Email: Jo.Ward@hey.nhs.uk, HullNeuroOncology@nhs.net
The form and imaging MUST be received by midday Thursday for the case to be discussed in same week Friday MDT.
Appendix (iv) Primary Care Referral Guidelines

Introduction

This referral guideline and the full Brain & CNS CEG Network Guidelines are also available separately on the NEYHCA (Cancer) website. Please press control and click on the link below:

http://www.hyccn.nhs.uk/NetworkGuidelinesAndPublications/bcns.htm

The following pathway outlines the referral processes for patients with suspected Brain or Other CNS Tumour. 2WW and MDT referral forms are available in the NEYHCA (Cancer) guidelines and from the following website. Please press control and click on the links below:

http://intranet/neurosurgery/proforma.asp
http://www.hey.nhs.uk/content/services/neurosurgery.aspx

The pathway make references to the NICE Referral Guidelines for Suspected Cancer June 2005 (currently under review) http://guidance.nice.org.uk/CG27 and the Scottish Referral Guidelines for Patients with Suspected Cancer June 2005 Guidelines. Please press control and click on the link:

http://www.scotland.gov.uk/Publications/2002/05/14862/5428

This guideline is localised for the three areas covered by NEYHCA (Cancer) and the information contained within this booklet covers patients who are referred to the specialist service at Hull and East Yorkshire NHS Trust (HEYHT) Practitioners should still use clinical judgement in assessing their patient’s symptoms and assessment for referral.
### Table of HEYHT Key Contacts

<table>
<thead>
<tr>
<th>Designation</th>
<th>Name</th>
<th>Contact</th>
<th>Subspecialty</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
1. Referral Protocol: Brain Tumour

**Symptom Complex**

- **Headache**
  - Features suspicious of malignancy
    - Patients with headache, vomiting & papilloedema

- **Seizures**
  - New onset seizures characterised by one or more of the following:
    - Focal Seizures
    - Significant post-ictal focal deficit (excluding confusion)
    - Epilepsy presenting as status epilepticus
    - Associated inter-ictal focal deficit
    - Associated preceding persistent headache of recent onset
    - Seizure frequency accelerating over weeks or months

- **Focal Neurological Deficit**
  - Sub acute progressive neurological deficit in the absence of previously diagnosed or suspected alternative disorders (e.g. multiple sclerosis)

- **Mental Health Changes**
  - Unexplained cognitive or behavioural changes

- **Acute Neurological Presentation**
  - Local Acute Trust
    - Local Imaging shows tumour

**Referral route**

- 2 week wait referral to Neurological Call centre. Fax 01482 675505
  - Contact nMDT / cMDT Coordinator
- Routine appointment in Neurology Clinic by CAB system. Letter to call centre
- Neurological Registrar on call

If appropriate referral route is not clear please contact Neurologist on call to discuss
2. Brain Tumours: Guidelines for Urgent Referral

2.1 Presentation

<table>
<thead>
<tr>
<th>Referral Numbers</th>
<th>Approx 600+ new referrals to the nMDT / cMDT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Rare below 30 years - but relatively evenly distributed thereafter (peak at age 70 - 79 years).</td>
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</tbody>
</table>

Patients with brain tumours typically present with one of the following:

- Progressive neurological deficit (e.g. progressive weakness, sensory loss, dysphasia, ataxia) developing over days to weeks.
- Seizure disorder.
- Headache frequently associated with evidence of raised intracranial pressure (vomiting, papilloedema etc.)
- Cognitive/personality (mental state) changes.

Prevalence among patients presenting with brain tumours:

<p>| | |</p>
<table>
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<tbody>
<tr>
<td>Headaches</td>
<td>50 – 70 %</td>
</tr>
<tr>
<td>Focal Neurological Deficit</td>
<td>30 – 50 %</td>
</tr>
<tr>
<td>Seizures</td>
<td>25 – 40 %</td>
</tr>
<tr>
<td>Mental Changes</td>
<td>15 – 30 %</td>
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</table>

The probability of having a brain tumour in the following situations is as follows:

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</thead>
<tbody>
<tr>
<td>New onset seizure disorder (any type) in adults</td>
<td>2 – 6 %</td>
</tr>
<tr>
<td>New onset status epilepticus</td>
<td>10 %</td>
</tr>
<tr>
<td>Chronic daily headache</td>
<td>&lt;1 %</td>
</tr>
<tr>
<td>(without features of raised intracranial pressure)</td>
<td></td>
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</tbody>
</table>
2.2 Neurological Deficit
• Subacute progressive neurological deficit in the absence of previously diagnosed or suspected alternative disorders (e.g. multiple sclerosis).

2.3 Seizure
New onset seizures characterised by one or more of the following:
• Focal seizures.
• Significant post-ictal focal deficit (excluding confusion).
• Epilepsy presenting as status epilepticus.
• Associated inter-ictal focal deficit.
• Associated preceding persistent headache of recent onset.
• Seizure frequency accelerating over weeks or months.

2.4 Headache
• Patients with headache, vomiting and papilloedema.

2.5 Consider urgent referral for
• Patients with non-migrainous headaches of recent onset, when accompanied by features suggestive of raised intra cranial pressure (e.g. woken by headache; vomiting; drowsiness), progressive neurological deficit or new seizure disorder.

NB. This last guideline is intended to provide the primary care physician with the discretion to decline urgent referral if there are other known features (e.g. depression, somatisation disorder) making a diagnosis of brain tumour very unlikely.

2.6 General Recommendations (NICE)
• A patient who presents with symptoms suggestive of brain or CNS cancer should be referred to an appropriate specialist, depending on local arrangements.
• If a primary healthcare professional has concerns about the interpretation of a patient’s symptoms and/or signs, a discussion with a local specialist should be considered.
• If rapid access to scanning is available, this investigation should also be considered as an alternative.

2.7 Specific recommendations
• In patients with new, unexplained headaches or neurological symptoms, the primary healthcare professional should undertake a neurological examination guided by the symptoms, but including examination for papilloedema. The absence of papilloedema does not exclude the possibility of a brain tumour.
• In any patient with symptoms related to the CNS (including progressive neurological deficit, new-onset seizures, headaches, mental changes, cranial nerve palsy, and unilateral sensorineural deafness) in whom a brain tumour is suspected, an urgent referral should be made. The development of new signs related to the CNS should be considered as potential indications for referral.
2.8 Headaches

- In patients with headaches of recent onset accompanied by either features suggestive of raised intracranial pressure (for example, vomiting, drowsiness, posture-related headache, headache with pulse-synchronous tinnitus) or other focal or non-focal neurological symptoms (for example, blackout, change in personality or memory), an urgent referral (2WW) should be made.
- In patients with unexplained headaches of recent onset, present for at least 1 month but not accompanied by features suggestive of raised intracranial pressure, discussion with a local specialist or referral (usually non-urgent) should be considered.
- In patients with a new, qualitatively different unexplained headache that becomes progressively severe, an urgent referral should be made.
- Re-assessment and re-examination is required if the patient does not progress according to expectations.

2.9 Seizures

- A detailed history should be taken from the patient and an eyewitness to the event if possible, to determine whether or not a seizure is likely to have occurred.
- In patients presenting with a seizure, a physical examination (including cardiac, neurological, mental state) and developmental assessment, where appropriate, should be carried out.
- In any patient with suspected recent-onset seizures, an urgent referral to a neurologist should be made.
- Other neurological features where an urgent referral to an appropriate specialist should be considered.

In patients with rapid progression of:

- Subacute focal neurological deficit.
- Unexplained cognitive impairment, behavioural disturbance, or slowness or a combination of these.
- Personality changes confirmed by a witness (for example, a carer, friend or a family member) and for which there is no reasonable explanation even in the absence of the other symptoms and signs of a brain tumour.

2.10 Risk factors

In patients previously diagnosed with any cancer an urgent referral should be made if the patient develops any of the following symptoms:

- Recent-onset seizure.
- Progressive neurological deficit.
- Persistent headaches.
- New mental or cognitive changes.
- New neurological signs.

The separate guidelines also contain the 2 Week Referral form which can be found in Appendix (iii) of these guidelines.
Appendix (v) WHO Classification of Tumours of Neuroepithelial Tissue

CNS Neoplasms

1. Astrocytic tumours
   1. Pilocytic Astrocytoma (WHO Grade I)
   2. Pilomyxoid Astrocytoma (WHO Grade II)
   3. Pleomorphic Xanthoastrocytoma (WHO Grade II)
   4. Diffuse Astrocytoma (WHO grade II)
      i. Variants: protoplasmic, gemistocytic, fibrillary
   5. Subependymal giant cell astrocytoma
   6. Anaplastic Astrocytoma (WHO Grade III)
   7. Glioblastoma (WHO grade IV)
      ii. Variants: giant cell glioblastoma, gliosarcoma
   8. Glioblastoma with Oligodendroglial Component (WHO Grade IV)
   9. Gliomatosis cerebri (WHO Grade III)

2. Oligodendroglial tumours
   1. Oligodendroglioma (WHO grade II)
   2. Anaplastic Oligodendroglioma (WHO grade III)
   3. Oligoastrocytoma (WHO Grade II)
   4. Anaplastic Oligoastrocytoma (WHO Grade III)

3. Ependymal cell tumours
   1. Subependymoma (WHO Grade I)
   2. Myxopapillary Ependymoma (WHO Grade I)
   3. Ependymoma (WHO grade II)
      i. Variants: cellular, papillary, clear cell, tanacytic, others
   5. Anaplastic ependymoma (WHO grade III)

4. Choroid Plexus Tumours
   1. Choroid plexus Papilloma
   2. Atypical choroid plexus Papilloma
   3. Choroid plexus carcinoma

5. Other Neuroepithelial Tumours
   1. Astroblastoma
   2. Chordoid Glioma of III Ventricle
   3. Angiocentric Glioma

6. Neuronal and Mixed Neuronal-Glial Tumours
   1. Desmoplastic infantile ganglioglioma
   2. Dysplastic gangliocytoma of cerebellum (Lhermitte Duclos)
   3. Dysembryoplastic neuroepithelial tumour
   4. Ganglioglioma and Gangliocytoma
   5. Anaplastic ganglioglioma
   6. Central neurocytoma and extraventricular neurocytoma
   7. Cerebellar liponeurocytoma
   8. Papillary glioneuronal tumour
   9. Rosette-forming glioneuronal tumour of the 4th ventricle
   10. Paraganglioma (spinal)
7. Tumours of the Pineal Region
   1. Pineocytoma
   2. Pineal parenchymal tumour of intermediate differentiation
   3. Pineoblastoma
   4. Papillary tumour of the pineal region

8. Embryonal tumours
   1. Medulloblastoma
   2. CNS primitive neuroectodermal tumours (PNET)
      i. Medulloepithelioma
      ii. Ependymoblastoma
   3. Atypical teratoid/rhabdoid tumour

9. Tumours of the Cranial & Paraspinal Nerves
   1. Schwannoma
   2. Neurofibroma
   3. Perineurioma
   4. Malignant peripheral nerve sheath tumour

10. Meningeal Tumours
    1. Meningiomas
    2. Mesenchymal, non-meningothelial tumours
    3. Haemangiopericytoma
    4. Melanocytic Lesions
    5. Haemangioblastoma

11. Tumours of the Haematopoietic System
    1. Malignant Lymphomas
    2. Histiocytic Tumours

12. Germ Cell Tumours
    1. Germinoma
    2. Mature Teratoma
    3. Immature Teratoma
    4. Teratoma with Malignant Transformation
    5. Yolk sac tumour
    6. Embryonal Carcinoma
    7. Choriocarcinoma
    8. Mixed germ cell tumour

13. Tumours of the Sellar Region
    1. Pituitary adenoma
    2. Pituitary carcinoma
    3. Craniopharyngioma
    4. Granular cell tumour
    5. Pituicytoma
    6. Spindle cell oncocytoma of the adenohypophysis

14. Metastatic tumours
Brief Clinical Summaries for the more common CNS Tumours

Glioblastoma - Clinical Summary

CT Appearance
- Inhomogeneous region of high signal attenuation consisting of necrotic or cystic core
- Significant mass effect and surrounding oedema
- Indistinct margins
- At least 95% of tumours enhance after administration of contrast material characteristically in an irregular, ring-shaped pattern near tumour periphery
- May cross the midline

MRI Appearance
- Prolonged T1 and T2 relaxation times
- Tumour margins may be poorly defined
- Significant mass effect and surrounding oedema
- Heterogeneous signal within tumour
- Enhancement similar to CT pattern
- Haemorrhage more common and haemosiderin may be observed

Histological Appearance
- Hypercellular
- Nuclear and/or cytoplasmic pleomorphism
- Have increased mitotic activity
- Show either microvascular proliferation or necrosis

Median Age: 50 to 60 years

Incidence 45% to 50% of gliomas

Location
- Any region of CNS possible; cerebral hemisphere predominate (40% frontal, 25% temporal, 25% parietal)
- Occasionally in corpus callosum (butterfly glioma)
- Deep grey nuclei and brain stem less likely

Presentation
- Symptoms of increased intracranial pressure (86% headaches, 45% nausea and vomiting) more common than with lower grade tumours
- Mental status changes (47%) and motor deficit (44%) also common
- Seizures at presentation in approximately 32%

Treatment
- Surgical resection
- Postoperative radiation therapy (RT) regardless of extent of resection
- Chemotherapy, reoperation at recurrence, interstitial brachytherapy and RT are treatment options.

Outcome
- Median survival after surgery, surgery plus RT, and surgery plus RT and chemotherapy is 4, 9.25, and 10 months, respectively
- Reoperation and/or interstitial brachytherapy can increase survival by 9 to 12 months in selected patients
- 10% 2-year survival and 5.5% 5 year survival
Comment
- Prognostic factors include patient age, functional status, and tumour size after resection and after RT
- Some authors advocate only biopsy and adjuvant therapy for high-grade supratentorial tumours

Anaplastic Astrocytoma - Clinical Summary

CT Appearance
- Low or mixed attenuation
- Margins frequently ill-defined
- Mass effect and oedema
- Contrast enhancement in 80% - 90%

MRI Appearance
- Prolonged T1 and T2 relaxation times
- Less distinct margins than ordinary astrocytomas
- Moderate mass effect and oedema
- More heterogeneous signal than lower-grade tumours
- Enhancement may be variable but usually parallels CT pattern
- Minimal haemosiderin

Histological Appearance
- Moderate hypercellularity
- Moderate pleomorphism of cells and nuclei
- Increased mitotic activity
- No microvascular proliferation or necrosis

Median Age: 46 years

Incidence: 10% to 30% of gliomas

Location
- Cerebral hemisphere, especially frontal, temporal, and parietal lobes in approximately the same percentage as for low grade tumours
- Thalamus, midbrain, or pons less likely

Presentation
- Seizures are the initial symptom in at least 50% of patients
- Other symptoms include those due to increased intracranial pressure (40%), mental status changes (15% to 20%) or focal deficit (10% to 15%)
- Mean duration of symptoms 16 months

Treatment
- Surgical resection
- Postoperative radiation therapy regardless of the extent of resection
- Treatment options at recurrence are repeat resection, chemotherapy, interstitial brachytherapy and radiosurgery

Outcome
- Approximately 40% to 50% 2 year survival and 18% 5 year survival after surgery plus radiation and chemotherapy
Comment
- Prognostic indicators include age, functional status, residual tumour size
- Up to 45% of recurrent tumours show progression to higher grades
- Incidence varies, partly because of differences in classification schemes

Oligodendroglioma - Clinical Summary

CT Appearance
- Tumour tissue is hypodense or isodense
- Irregular areas of calcification in more than 70%
- Cystic changes and haemorrhage rare
- With anaplastic changes, calcification less common
- Oedema and contrast enhancement common only with anaplastic tumours

MRI Appearance
- Prolonged T1 and T2 relaxation times
- Absent to slight enhancement typical
- Heterogeneous signal with areas of low intensity due to calcification

Histological Appearance
- Uniform cells with oval nuclei, clear cytoplasm, and defined cell membranes
- Prominent vasculature in a “chicken wire” pattern
- Mineralization in 70% to 90%
- May show microvascular proliferation or necrosis (anaplastic oligodendroglioma)

Median Age: 43 years

Incidence: 4% to 6% of gliomas

Location
- Cerebral hemisphere: frontal (50%), temporal and parietal (15% to 25%) each, most common
- Occipital

Presentation
- Seizures in >50%; median duration, 48 months
- Headache in 30% to 78%
- Others include mental status changes, visual complaints, focal weakness; median duration of symptoms is 20 months in the absence of seizures

Treatment
- Surgical resection
- Radiation therapy after subtotal resection; some authors recommend regardless of extent of resection
- Anecdotal reports of chemotherapy and/or repeat resection for treatment failure

Outcome
- Median survival 35 to 60 months
- 5-year survival 35% to 60%; 10-year survival 25% to 30%
- Radiation therapy increases median survival by 12 months or less after subtotal resection; does not affect survival after gross total resection
Comment

- No randomised trials of role of radiation therapy
- Progression to anaplastic oligodendroglioma in up to 50% of recurrent tumours
- Low grade astrocytic elements do not worsen prognosis
- Prognosis of a mixed oligoastrocytoma with anaplastic astrocytic elements parallels that of the astrocytic component
- Favourable prognosis factors include preoperative functional status, presence of calcification, and lack of anaplasia

Intracranial Ependymoma - Clinical Summary

CT Appearance

- Mixed density, isodense, or slightly hyperdense tumour tissue
- Fine calcification seen in approximately 50% of tumours
- May have cystic areas, especially in cerebral locations
- More than 80% enhance

MRI Appearance

- Heterogeneous signal intensities; prolonged T1 and T2 relaxation times
- Punctate, markedly hypointense areas on T1 weighted images due to calcification or cystic changes
- Inhomogeneous enhancement with gadolinium

Histological Appearance (D)

- Uniform ependymal cells in pattern of rosettes, canals or perivascular pseudorosettes
- Variants include: papillary, cellular, clear cell and tanacytic.

Median Age: 25 years

Incidence: 3% to 4% of gliomas

Location

- Fourth ventricle, including floor and lateral recess; may extend into cerebellopontine angle
- In or near third and lateral ventricles
- 2/3 are posterior fossa (more common in the young), while 1/3 are supratentorial (more common in adults)

Presentation

- Headache in over 80%
- Nausea and vomiting in 50% to 80%
- Others include cerebellar dysfunction and papilloedema on exam
- Median duration of symptoms 4 months

Treatment

- Surgical resection
- Radiation therapy critical; dosing depends on tumour location, grade, and surgical outcome
- Repeat resection and/or chemotherapy are options at recurrence
Outcome
- Overall survival 35% to 60% at 5 years
- 1/3 to 2/3 will recur, with increased incidence if anaplastic changes are present
- Most treatment failures are apparent within 2 years of therapy, and more than 90% of these are local recurrences

Comment
- Increased incidence of anaplastic changes in supratentorial lesions
- No clear relationship between anaplastic changes and patient outcome
- Rare to absent tumour progression to increased anaplasia on recurrence

Pilocytic Astrocytoma - Clinical Summary
CT Appearance: Cerebellar Location
- Slight hypodense to isodense
- Well-defined macrocystic hypodense cores in >50%
- Calcification seen in 22%
- Displaces/compresses fourth ventricle
- Mural nodule strongly contrast-enhancing, may display mixed densities
- At right, a contrast-enhanced CT scan of a 22 year old man who presented with headache and decreased balance

MRI Appearance: Cerebellar Location
- Sharply defined macrocystic mass
- Prolonged T1 and T2 relaxation times
- Mural nodule usually identifiable
- Pronounced contrast-enhancement of nodule; cyst wall enhances variably

Histological Appearance
- Fusiform cells with wavy fibrillary processes
- Rosenthal fibres common but not invariable
- Eosinophilic granular bodies common
- Microcystic areas with stellate astrocytes alternate with pilocytic areas (biphasic pattern)
- May form macrocysts, especially in cerebral hemispheres

Median Age: 13 year

Incidence: 2% of gliomas

Location
- Cerebellum/brain stem (61%)
- Optic chiasm/hypothalamus (28%)
- Cerebral hemisphere (11%)

Presentation
- Cerebellar tumours: symptoms of increased intracranial pressure from hydrocephalus (headache, vomiting and papilloedema), cerebellar dysfunction (gait disturbance, ataxia, nystagmus) or sixth cranial nerve palsy
- Chiasmatic tumours: visual deficit, endocrine dysfunction, or symptoms of hydrocephalus
- Hemispheric lesions: headache, seizures, or focal weakness
Treatment
- Resect if possible
- Radiation therapy (RT) is controversial, some recommend after subtotal resection (STR) and if patient is at least 3 years old
- Anecdotal reports of chemotherapy in younger patients

Outcome
- Complete resection yields 100% recurrence-free survival without adjuvant therapy
- 10- and 20-year freedom-from-progression rates are 74% and 41% after STR/RT
- 10- and 20-year survival rates are 81% and 54% after STR/RT

Comment
- Incidence of neurofibromatosis with gliomas of optic nerve and chiasm >40%
- CSF seeding or anaplastic transformation is rare

Astrocytoma - Clinical Summary

CT Appearance
- Hypodense or occasionally isodense
- No significant mass effect or oedema
- Contrast enhancement rare

MRI Appearance
- Lesion is usually well defined
- Normal to slightly prolonged T1 relaxation time
- Prolonged T2 relaxation time
- Homogeneous signal
- Little mass effect or oedema
- Contrast enhancement similar to that seen on CT scans

Histological Appearance
- Mild hypercellularity
- Nuclei may be enlarged but no significant pleomorphism
- No significant mitotic activity
- No endothelial proliferation
- No necrosis

Median Age: 35 to 45 years

Incidence: 5% to 25% of gliomas

Location
- Cerebral hemispheres, especially frontal (40%), temporal (25%) and parietal (25%) lobes
- Others (10%) include thalamus, midbrain, pons

Presentation
- Seizures are most common (65%), duration may be years
- Symptoms of increased intracranial pressure (40%), mental status changes (15%) or focal deficits (10%) are less common

Treatment
- Surgical resection
- Postoperative radiation therapy controversial
- Chemotherapy not indicated
Outcome

- Median survival approximately 3 1/2 years; 5-year survival rate 26% to 33%
- Radiation therapy increases 1- and 3-year survival rates but not beyond

Comment

- Progression to anaplasia in up to 86% of recurring tumours
- Prognostic factors include patient age, functional status, and extent of resection
- Incidence varies widely, partly because of differences in classification schemes
Appendix (vi) Brain & CNS Imaging Guidelines

1. Introduction

‘A Guideline is not a rigid constraint upon clinical practice, but a concept of good practice against which the requirements of the individual patient can be considered’. (RCR, 1990).

It therefore remains the responsibility of the practising clinicians to interpret the application of guidelines, taking into account local service constraints and the needs and wishes of the patients.

This Guidance is based on the recommendations contained in:


It is not intended to be prescriptive nor exhaustive, but a guide towards best practice. Imaging protocols may vary depending on local circumstances, and the quality of the imaging service should be supported by regular audit and by attendance at multidisciplinary meetings.

Services should be planned to minimise travelling times whilst maintaining the highest standards of specialist care using local expertise and agreed protocols (Calman Hine report, paragraph 4.1.4) Patients should be scanned locally where there is suitable equipment and expertise.

In a large geographical area, imaging performed in different sites will vary depending on equipment availability, local expertise and imaging provider. Minimum standards of imaging are required to prevent duplication together with means of rapid image transfer across NHS net

2. Gliomas

2.1 Staging

2.1.1 CT

CT may be the initial investigation in many cases. If conservative management is deemed appropriate after initial assessment then this may suffice. All other cases should be imaged with MRI unless contraindicated. If MRI is clearly indicated on the basis of the unenhanced scan, a post-contrast CT is not necessary.

2.1.2 MRI

The following sequences should be acquired. Detailed parameters are in Appendix i.

Standard sequences
- Sagittal T2W FSE
- Axial T2W FLAIR
- Diffusion weighted imaging including an ADC map
Coronal T1W SE  
Post gadolinium coronal T1W SE  
Post gadolinium axially acquired T1W gradient echo volume suitable for use with the image guided surgical system, currently Brain Lab (see appendix)

Optional sequences  
Axial T2*W gradient echo - for characterisation of haemorrhage or calcification  
Post gadolinium T1W SE – useful for midline tumours e.g. pineal region. For pituitary see 1.1.4  
3D high resolution T2W FSE or T2*W GRE – can be useful for determining if intra or extra axial location

Advanced imaging sequences  
(These are likely to be performed only in the tertiary centre)  
Perfusion weighted imaging  
MR Spectroscopy  
Functional MRI  
MR Tractography

A DICOM volume with contrast performed using the following parameters should be performed to facilitate image guided surgery and prevent the need for re-scanning.  
*NB* Where a primary brain tumour is considered the likely diagnosis and a secondary tumour relatively unlikely a search for a speculative extra cranial primary tumour with a whole body CT is NOT indicated unless specifically requested by the MDT.

2.2 Follow up imaging

Early post-operative imaging is performed in selected cases. Ideally this is undertaken within 24 hours of surgery.

Typically high grade gliomas will be followed up 3 monthly and low grade gliomas 6 – 12 monthly, subject to discussion by the MDT. It is important that slice thickness and image plane orientation are as consistent as possible for follow up scans.

3. Meningiomas

3.1 Staging

3.1.1 CT

CT may have been performed as the initial investigation. Occasionally for simple convexity meningiomas surgery will be performed on the basis of CT imaging only. It may provide useful information on bone involvement particularly for skull base tumours

CT venography (CTV) may be used as an alternative to MRV or to clarify uncertainties on MRV

A CT may be required for bony anatomy related to approaches

3.1.2 MRI

The standard, optional and advanced MRI protocols are the same as for gliomas (See 2.1.2)
For skull base meningiomas it may be helpful to use fat suppression on the post-gadolinium coronal sequence. In addition MR venography (MRV) (3D phase contrast ideally) should be included if the tumour encroaches on a dural venous sinus and particularly if venous occlusion is suspected. In cases where occlusion is in doubt MR-DSA is helpful and more sensitive in determining occlusion.

3.1.3 Catheter angiography (DSA)

This is rarely required for purely diagnostic purposes but will be performed as a preliminary to pre-operative embolisation in many cases.

CT, MR or conventional angiography may be required if there is possible sinus involvement. Petrosal venous sinus sampling may be required to localise functional adenomas.

3.2 Follow up imaging

Early post-operative imaging is performed in occasional cases and does not have to be as early as for gliomas.

Follow up imaging should follow the standard MRI protocol +/- MRV at an interval determined by the MDT, typically 6-12 months initially. If there are aggressive histological features more frequent imaging will be required.

4. Metastases

4.1 Staging

4.1.1 CT

Standard brain CT scanning without and with iv contrast will demonstrate the majority of cases of cerebral metastases although may underestimate the number of lesions compared to MRI. CT has poor sensitivity for meningeal metastases. High resolution bone algorithm images should be reviewed as a matter of routine for tumours where bone metastases are common.

CT may suffice for patient management in a number of instances. This should be a decision of the site specific MDT with advice from Neurosciences if necessary.

If a primary tumour is likely appropriate imaging may be required for staging. Patients are likely to require a CT of the Chest and Abdomen.

4.1.2 MRI

The standard protocol for gliomas (2.1.2) should be followed with optional sequences if required. Double standard dose gadolinium has been reported as increasing the detection of parenchymal and meningeal disease but is not routinely used. MR spectroscopy may help to distinguish primary from secondary tumours.

4.13 Imaging for an unknown primary tumour
If the patient is not known to have a primary tumour and an extracranial primary source of the tumour is likely, whole body imaging may be required, typically a CT of the Chest and Abdomen.

4.2 Follow up imaging

Follow up imaging may be with CT or MRI, typically 3 – 6 monthly depending on type, and will be determined by the site specific MDT.

5. Pituitary Tumours

5.1 Staging

5.1.1 CT

Multislice CT can demonstrate the pituitary gland and region quite well but MRI is superior, particularly for detection of microadenomas. As a primary investigation for pituitary, CT is only indicated where MRI is contraindicated.

5.1.2 MRI

Standard sequences
- Whole brain: Axial T2W FLAIR
- Thin section (3mm or less – see appendix) pituitary region
- Coronal T1W SE
- Coronal T2W FSE (this is important for delineation of the optic chiasm and nerves)
- Sagittal T1W SE – optional but essential if demonstration of the neurohypophysis is important e.g. in diabetes insipidus
- Post gadolinium sagittal and coronal T1W SE

Optional sequences
- Dynamic contrast enhanced T1W SE – rarely required but can demonstrate small microadenomas not otherwise seen (<5% cases)
- T2*W gradient echo – if pituitary apoplexy/intratumoural haemorrhage is suspected
- If pathologies other than pituitary adenoma are suspected after preliminary imaging eg lymphoma, germinoma or metastasis, at least one gadolinium sequence of the whole brain should be acquired to assess for remote disease

Petrosal venous sinus sampling may rarely be required to localise functional adenomas in Cushing’s syndrome

5.2 Follow up imaging

Early post-operative imaging (MRI) is performed in occasional cases and ideally within 24 hours. Follow up imaging should follow the standard MRI protocol at an interval determined by the MDT, typically 6-12 months initially. Contrast is often not required – for example to determine change in size of a macroadenoma.
6 Acoustic Neuromas

6.1 Screening for acoustic neuroma

6.1.1 CT

This is insensitive for small CP angle tumours and canalicular tumours and should only be performed if MRI is contraindicated. If so than a high dose post contrast scan should be performed including high resolution bone reconstructions corrected accurately for head tilt.

6.1.2 MRI

High resolution axial +/- coronal
Whole brain axial T2W FLAIR

If the screening scan is positive the following sequences should be added depending on the suspected differential diagnosis:

Likely acoustic neuroma or meningioma
   Coronal high resolution 3D T2W FSE or T2*W GRE (if not already performed)
   Axial T1W SE without contrast (risk of missing lipoma (although very rare) if no pre-contrast study)
   Post gadolinium axial and coronal T1W SE

   Slice thickness depends on the size of the tumour. (1.5cm CP angle tumours do not require 0.7mm slices)
   A CT may be useful for bony anatomy related to approaches but only if the surgeon requires it.

Cystic lesion – possible arachnoid cyst or epidermoid cyst
   DWI - will distinguish these with a high degree of specificity

6.2 Follow up Imaging

6.2.1 Surveillance

Many of these tumours are under long term surveillance with scans performed annually together with audiology if hearing is preserved. It is important that there is consistency of scan protocols – sequence type (this may require follow up on same model of scanner), and especially slice thickness and orientation.

Most small acoustic neuromas can be followed without gadolinium enhancement:

High resolution axial and coronal T2W FSE or T2*W GRE
Measurements should ideally be in 3 orthogonal planes, comparable with previous measurements and, for CP angle tumours, not include the intracanalicular component.

Contrast enhanced scans may be necessary for more complex tumours and should be comparable with the previous study.
6.2.2 Surgical cases

Early post operative scanning may be required to assess the degree of resection. Routine follow up is as for surveillance but contrast enhanced scans may be required in a higher proportion of cases. Scan interval may be 3-6 months in the first instance and typically annual thereafter, subject to MDT discussion.

7. Transfer of Images

Ideally images should be available immediately across NHS net or the Internet by remote access to each Trust’s PACs. This should work both ways so that when patients attend for follow up imaging previous studies are available at the time of scanning to ensure consistent protocols.

If possible images should be sent across NHS net in DICOM format to HEYPACS. In case of difficulties the HEYPACS team may be contacted.

If network transfer is not possible, original DICOM images with viewer should be sent with the patient on a CD. These can be used for emergency treatment and uploaded to HEY PACs.

As a final resort, picture images can be sent to the HRI centricity webserver. This system is not considered safe for clinical use but in emergency is acceptable.

Imaging Guidelines Appendix (i) Scan parameters for Philips Intera MRI scanner

1. Gliomas / Meningiomas / Metastases

<table>
<thead>
<tr>
<th></th>
<th>TR</th>
<th>TE</th>
<th>Slice thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2 Sag</td>
<td>4500</td>
<td>100</td>
<td>4/1</td>
</tr>
<tr>
<td>FLAIR Ax</td>
<td>10,000</td>
<td>120</td>
<td>5/1</td>
</tr>
<tr>
<td>Cor T1</td>
<td>500</td>
<td>12</td>
<td>5/1</td>
</tr>
<tr>
<td>DWI</td>
<td>3328</td>
<td>86</td>
<td>5/1</td>
</tr>
<tr>
<td>AX STEALTH</td>
<td>9.7</td>
<td>4.6</td>
<td>1.3</td>
</tr>
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</table>

2. Pituitary

<table>
<thead>
<tr>
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<th>TR</th>
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<th>Slice thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLAIR Ax</td>
<td>10,000</td>
<td>120</td>
<td>5/1</td>
</tr>
<tr>
<td>Cor T2</td>
<td>3,000</td>
<td>120</td>
<td>2/0.2</td>
</tr>
<tr>
<td>Cor T1</td>
<td>475</td>
<td>15</td>
<td>2/0.2</td>
</tr>
<tr>
<td>SAG T1 (post contrast)</td>
<td>525</td>
<td>15</td>
<td>2/0.2</td>
</tr>
<tr>
<td>Dynamic</td>
<td>245</td>
<td>10</td>
<td>3/0.3</td>
</tr>
</tbody>
</table>

3. Acoustic / IAMs

<table>
<thead>
<tr>
<th></th>
<th>TR</th>
<th>TE</th>
<th>Slice thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLAIR Ax</td>
<td>10,000</td>
<td>120</td>
<td>5/1</td>
</tr>
<tr>
<td>Ax/Cor T2 3D</td>
<td>4000</td>
<td>250</td>
<td>0.4</td>
</tr>
<tr>
<td>Ax T1</td>
<td>550</td>
<td>15</td>
<td>2/0.2</td>
</tr>
<tr>
<td>Cor T1 (post-contrast)</td>
<td>450</td>
<td>10</td>
<td>1.5/0.15</td>
</tr>
</tbody>
</table>
Appendix (vii) ECOG Performance Status

<table>
<thead>
<tr>
<th>Grade</th>
<th>ECOG</th>
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<tbody>
<tr>
<td>0</td>
<td>Fully active, able to carry on all pre-disease performance without restriction</td>
</tr>
<tr>
<td>1</td>
<td>Restricted in physically strenuous activity but ambulatory and able to carry out work of a light or sedentary nature, e.g., light house work, office work</td>
</tr>
<tr>
<td>2</td>
<td>Ambulatory and capable of all self-care but unable to carry out any work activities. Up and about more than 50% of waking hours</td>
</tr>
<tr>
<td>3</td>
<td>Capable of only limited self-care, confined to bed or chair more than 50% of waking hours</td>
</tr>
<tr>
<td>4</td>
<td>Completely disabled. Cannot carry on any self-care. Totally confined to bed or chair</td>
</tr>
<tr>
<td>5</td>
<td>Dead</td>
</tr>
</tbody>
</table>

Appendix (viii) Karnofsky Performance Status Scale

The Karnofsky Performance Scale Index allows patients to be classified as to their functional impairment. This can be used to compare effectiveness of different therapies and to assess the prognosis in individual patients. The lower the Karnofsky score, the worse the survival for most serious illnesses.

**DEFINITIONS**

<table>
<thead>
<tr>
<th>RATING (%)</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Normal no complaints; no evidence of disease.</td>
</tr>
<tr>
<td>90</td>
<td>Able to carry on normal activity; minor signs or symptoms of disease.</td>
</tr>
<tr>
<td>80</td>
<td>Normal activity with effort; some signs or symptoms of disease.</td>
</tr>
<tr>
<td>70</td>
<td>Cares for self; unable to carry on normal activity or to do active work.</td>
</tr>
<tr>
<td>60</td>
<td>Requires occasional assistance, but is able to care for most of his personal needs.</td>
</tr>
<tr>
<td>50</td>
<td>Requires considerable assistance and frequent medical care.</td>
</tr>
<tr>
<td>40</td>
<td>Disabled; requires special care and assistance</td>
</tr>
<tr>
<td>30</td>
<td>Severely disabled; hospital admission is indicated although death not imminent.</td>
</tr>
<tr>
<td>20</td>
<td>Very sick; hospital admission necessary; active supportive treatment necessary.</td>
</tr>
<tr>
<td>10</td>
<td>Moribund; fatal processes progressing rapidly.</td>
</tr>
<tr>
<td>0</td>
<td>Dead</td>
</tr>
</tbody>
</table>
Appendix (ix) Referral Criteria for Proton Beam Therapy & Referral Form

Summary and Contact Details

- High energy proton treatment is now centrally funded through NCG for limited patient groups for treatment abroad
- Existing arrangements for ocular malignancy treatment at Clatterbridge are unaffected
- A Clinical Reference Panel will review clinical details and imaging to approve referrals
- Referral forms and guidance available on RCR and NCG websites
- Referrals and contact with treatment centres abroad should not be made until formal approval has been given by the NCG for each case.
- It is strongly suggested that adult cases should be seen and referred by a Clinical Oncologist
- Referrals should be sent to the NCG via nhs.net email to: leedsth-tr.ProtonNCG@nhs.net

Imaging on CD-ROM should be sent to:

Dr Adrian Crellin
Consultant Clinical Oncologist
NCG Proton Reference Panel
St James’s Institute of Oncology
Level 4 Bexley Wing
St James’s University Hospital
Beckett Street
LEEDS LS9 7TF
Tel 0113 2068602
Fax 0113 2067561
adrian.crellin@nhs.net

- If the case is approved the referring clinician will be informed and a suggested treatment centre and contact for referral will be given.
- After approval the referring clinician will retain primary clinical responsibility (discussions with the patient, referral to the treatment centre and follow up care after treatment).
- Funding covers treatment costs, basic level travel and accommodation. The NCG Policy is available on the NCG and RCR websites. The referring centre will be responsible for making travel and accommodation arrangements

BEFORE cases are discussed or referred to treatment centres.

Local pathway

It is vital that BEFORE a referral is made:
- A full Multi-Disciplinary Team (MDT) has considered the case
- The pros and cons of Proton Treatment compared with conventional radiotherapy and / or IMRT has been discussed in each case with a Clinical Oncologist.

Diagnoses approved for funded treatment abroad

A wide range of factors need to be taken into account in assessing if Proton Therapy confers any significant advantage over conventional radiotherapy or IMRT. The diagnosis alone is often not sufficient.

These include the timing of radiotherapy in relation to other treatments.
Adult
- Base of Skull & Spinal Chordoma
- Base of Skull Chondrosarcoma
- Spinal & Paraspinal Bone and Soft Tissue
- Sarcomas

Paediatric
- Base of Skull & Spinal Chordoma
- Base of Skull Chondrosarcoma
- Spinal & Paraspinal Bone and Soft Tissue
- Sarcomas
- Rhabdomyosarcoma
- Orbit
- Parameningeal & Head & Neck
- Pelvis
- Ependymoma
- Ewings Sarcoma
- Retinoblastoma
- Pelvic Sarcoma
- Optic Pathway and other selected Low Grade
- Glioma
- Craniopharyngioma
- Pineal Parenchymal Tumours (not Pineoblastoma)
- Esthesioneuroblastoma
## NCG Proton Treatment Referral Form

<table>
<thead>
<tr>
<th>Surname</th>
<th>Referral Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Name</td>
<td>Gender Male / Female</td>
</tr>
<tr>
<td>DOB</td>
<td></td>
</tr>
<tr>
<td>NHS number</td>
<td>Hospital number</td>
</tr>
<tr>
<td>Address</td>
<td>GP Name</td>
</tr>
<tr>
<td>Postcode</td>
<td>Address</td>
</tr>
<tr>
<td>Patient phone number</td>
<td></td>
</tr>
<tr>
<td>Patient email</td>
<td></td>
</tr>
<tr>
<td>Referring Clinician</td>
<td>Telephone</td>
</tr>
<tr>
<td>Referring Centre</td>
<td>Fax</td>
</tr>
<tr>
<td>Centre Address</td>
<td>Email address</td>
</tr>
<tr>
<td>Surgeon</td>
<td>Telephone</td>
</tr>
<tr>
<td>Hospital</td>
<td></td>
</tr>
<tr>
<td>Postal address</td>
<td>Email address</td>
</tr>
</tbody>
</table>
Clinical Summary
(Include Past Medical History)

Clinical condition
Neurological deficits

Mobility

Communication ability

Overall performance status
WHO / ECOG PS 0 1 2 3
(Scale shown below)
(Delete as appropriate)
**WHO/ECOG Performance Status**

0 Fully active, able to carry on all pre-disease performance without restriction

1 Restricted in physically strenuous activity but ambulatory and able to carry out work of a light or sedentary nature, e.g., light house work, office work

2 Ambulatory and capable of all self-care but unable to carry out any work activities. Up and about more than 50% of waking hours

3 Capable of only limited self-care, confined to bed or chair more than 50% of waking hours

4 Completely disabled. Cannot carry on any self-care. Totally confined to bed or chair

Present medication:

Allergies:

**Enclosures Checklist**

- Histology Report: Y / N
- Operation Report: Y / N
- Imaging CD-ROM: Y / N
- Radiology Reports: Y / N
- Foreign Language?
- Willing to Travel: Y / N

Email to: leedsth-tr.protonNCG@nhs.net
Fax: 0113 2067561

Help - Contact - 0113 2068602

PLEASE NOTE: It is an NCG requirement that THIS FORM and ALL supporting information including relevant letters, summaries, operation reports, radiology / histology reports, imaging on CD-ROM are received before a case will be officially processed and considered.
### Appendix (x) NEYHCA (Cancer) MDT meetings for Brain & CNS Tumours / Referral PCTs / Catchment Populations / Table of Key Contacts - April 2012

<table>
<thead>
<tr>
<th>Trust</th>
<th>Location</th>
<th>Arrangements for Specialist Care</th>
<th>Day</th>
<th>Time</th>
<th>Lead Clinician / Phone Numbers CNs</th>
<th>MDT Co-ordinators</th>
<th>Patient Trackers</th>
<th>Data Administrators</th>
<th>Urgent Referral Fax</th>
</tr>
</thead>
<tbody>
<tr>
<td>York Teaching Hospital NHS Foundation Trust</td>
<td>York District Hospital</td>
<td>cMDT HRI</td>
<td>Dr P Duffey</td>
<td>n/a</td>
<td>TBC</td>
<td>n/a</td>
<td>Dr M Hingorani, Tel: 01482 675505</td>
<td>01482 675505</td>
<td></td>
</tr>
<tr>
<td>Northern Lincolnshire &amp; Goole Foundation NHS Trust</td>
<td>York team also refer to Leeds</td>
<td>mMDT HRI</td>
<td>Dr Lazarus, Sec: Katherine Green, Tel: 01472 874111</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>Dr Amit Banerjee, Sec: Ann Wilkinson, Tel: 01724 282282 ext 2922</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scarboroug and North East Yorkshire Healthcare NHS Trust</td>
<td>York team also refer to Leeds</td>
<td>Specialist Pituitary MDT</td>
<td>Dr T Zuromskis</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>Mr S Achawal, Sec: Julie Power, Tel: 01723 342491 Fax: 761309</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hull and East Yorkshire Hospitals NHS Trust</td>
<td>Hull Teaching PCT 252,400 East Riding of Yorkshire 37,000</td>
<td>cMDT HRI</td>
<td>Dr M Hingorani, Tel: 01482 607892 Fax: 607892</td>
<td>3rd Tuesday of the month</td>
<td>4.00 - 5.00 pm</td>
<td>n/a</td>
<td>01482 607892</td>
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</table>

## Appendix (xi) Brain & CNS CEG Members List (updated 1.12.2011)

<table>
<thead>
<tr>
<th>Members full name</th>
<th>Job Title</th>
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<tbody>
<tr>
<td><strong>Hull and East Yorkshire Hospitals NHS Trust</strong></td>
<td></td>
</tr>
<tr>
<td>Mr Shailendra Achawal</td>
<td>Consultant Neurosurgeon</td>
</tr>
<tr>
<td>Dr Mo Aye</td>
<td>Consultant Endocrinologist</td>
</tr>
<tr>
<td>Mrs Louise Baker</td>
<td>Neuro-oncology CNS</td>
</tr>
<tr>
<td>Dr Richard Bartlett</td>
<td>Consultant Neuro Radiologist</td>
</tr>
<tr>
<td>Dr Samar Betmouni</td>
<td>Consultant Neuropathologist</td>
</tr>
<tr>
<td>Ms Angela Carling</td>
<td>Laboratory Manager</td>
</tr>
<tr>
<td>Dr Sanjay Dixit</td>
<td>Consultant Clinical Oncologist</td>
</tr>
<tr>
<td>Ms Debra Dyble</td>
<td>Divisional General Manager - Medicine</td>
</tr>
<tr>
<td>Dr Nabil El-Mahdawi</td>
<td>Associate Specialist in Oncology</td>
</tr>
<tr>
<td>Ms Sally Fenton</td>
<td>Clinical Lead Physiotherapist for Neurosurgery</td>
</tr>
<tr>
<td>Mr Gary Foley</td>
<td>Head of Therapies</td>
</tr>
<tr>
<td>Ms Lynne Gill</td>
<td>Neuro-oncology CNS</td>
</tr>
<tr>
<td>Ms Catherine Hills</td>
<td>Neuropathology Manager</td>
</tr>
<tr>
<td>Dr Mohan Hingorani</td>
<td>Consultant Oncologist</td>
</tr>
<tr>
<td>Dr Anne Kunnacherry</td>
<td>Consultant Neurologist</td>
</tr>
<tr>
<td>Ms Lorraine Laws</td>
<td>Business Manager Neurosurgery</td>
</tr>
<tr>
<td>Dr Paul Maliakal</td>
<td>Consultant Neuro Radiologist</td>
</tr>
<tr>
<td>Mr Bruce Mathew</td>
<td>Chair of the Neurosurgical / Endocrine MDT</td>
</tr>
<tr>
<td>Ms Linsey Ness</td>
<td>Physiotherapist</td>
</tr>
<tr>
<td>Mr Gerry O’Reilly</td>
<td>Consultant Neurosurgeon</td>
</tr>
<tr>
<td>Ms Debbie Parker</td>
<td>Lead OT for Neurosciences</td>
</tr>
<tr>
<td>Mr Ashis Pathak</td>
<td>Consultant Neurosurgeon</td>
</tr>
<tr>
<td>Mrs Margaret Parrott</td>
<td>Trust Lead Cancer Manager</td>
</tr>
<tr>
<td>Mr Ashis Pathak</td>
<td>Consultant Neuropathologist</td>
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<tr>
<td>Mr Chittoor Rajaraman</td>
<td>Consultant Neurosurgeon</td>
</tr>
<tr>
<td>Dr Chris Rowland-Hill</td>
<td>Consultant Neuro Radiologist</td>
</tr>
<tr>
<td>Dr David Salvage</td>
<td>Consultant Radiologist</td>
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<tr>
<td>Dr Ian Scott</td>
<td>Consultant Neuropathologist</td>
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<tr>
<td>Dr Selen Selvachandran</td>
<td>Consultant Clinical Neuropsychologist</td>
</tr>
<tr>
<td>Ms Helena Shaw</td>
<td>Specialist speech and Language therapist</td>
</tr>
<tr>
<td>Ms Joanne Ward</td>
<td>Data Manager</td>
</tr>
<tr>
<td>Ms Lesley Windass</td>
<td>Director of Operations, Medicine</td>
</tr>
<tr>
<td>Ms Caroline Wright</td>
<td>Oncology Dietitian</td>
</tr>
<tr>
<td>Ms Helen Wright</td>
<td>Cancer Research Business Manager</td>
</tr>
<tr>
<td><strong>Northern Lincolnshire and Goole Hospitals NHS Foundation Trust</strong></td>
<td></td>
</tr>
<tr>
<td>Dr Amit Banerjee</td>
<td>Consultant Adult Medicine</td>
</tr>
<tr>
<td>Dr Stephen Beer</td>
<td>Consultant Physician/Director of Clinical Studies Acute</td>
</tr>
<tr>
<td>Ms Kathy Dent</td>
<td>Lead Research Nurse</td>
</tr>
<tr>
<td>Miss Louise Hobson</td>
<td>Trust Cancer Manager</td>
</tr>
<tr>
<td>Dr J P Lazarus</td>
<td>Consultant Neurologist</td>
</tr>
<tr>
<td>Ms Trudy Nurse</td>
<td>Senior Research Nurse</td>
</tr>
<tr>
<td>Miss Deborah Whitehead</td>
<td>Macmillan Lead Cancer Nurse</td>
</tr>
</tbody>
</table>
The Brain & CNS CEG Executive Team

Chair
Mr Shailendra Achawal Consultant Neurosurgeon HEYHT

Vice Chair
Dr Sanjay Dixit Consultant Clinical Oncologist HEYHT

Neurosciences MDT Lead
Mr Shailendra Achawal Consultant Neurosurgeon HEYHT

Cancer Network MDT Lead
Dr Mohan Hingorani Consultant Clinical Oncologist HEYHT

Pituitary MDT Lead
Mr. Ashis Pathak Consultant Neurosurgeon HEYHT

Area Lead for Neuro-psychology / psychiatry
Funding has been approved for a new appointment for this post and recruitment is currently in progress. Dr Catherine Derbyshire will take up the post of Consultant Clinical Neuropsychologist at HEYHT in July 2012

Area Lead for Neurorehabilitation
TBC

Member Responsible for User / Patient Information
Ms Lynne Gill Neuro-oncology CNS HEYHT

Member Responsible for the integration of Service Improvement:
Ms Louise Baker Neuro-oncology CNS HEYHT

Member Responsible for Recruitment into Clinical Trials
Dr Mohan Hingorani Consultant Oncologist HEYHT

Management & Administration support provided by the NEYHCA (Cancer) Office
Mrs Julie Bielby Macmillan Network Nurse Director / Executive Lead
Mrs Sue Reid Network Support Manager NEYHCA (Cancer)
(Any of the NEYHCA (Cancer) management can provide support in Mrs Bielby’s absence)
Mrs Joanne Graham Administrative Assistant NEYHCA (Cancer)
Mrs Jo Richardson Administrative Assistant NEYHCA (Cancer)
Ms Sue McKie Administrative Assistant NEYHCA (Cancer)
Guidelines Agreed (Clinical, Imaging & Pathology)

Agreement of the North East Yorkshire & Humber Clinical Alliance (Cancer) Guidelines for the Management of Adult Patients with Brain & Other CNS Tumours by the Brain & CNS Clinical Expert Group

These guidelines were developed by the former Brain & CNS NSSG, taking into account NICE Guidance and the IOG, and are the standard for care across the Clinical Alliance. They were discussed and circulated within the group as per the NEYHCA (Cancer) consultation process. All members were given the opportunity to assist in the publication of the guidelines / comment. The Guidelines were formally agreed by the Brain & CNS NSSG, at a quorate meeting. Those present at the meeting agreed the document on behalf of the group. Those not present at the meeting accept the groups’ decision. The groups’ attendance record for the meeting where the guidelines were agreed can be seen below. The guidelines agreement sheet was then signed by the Chair, MDT Leads, Network Imaging group Chair and Network Pathology Group Chair. The guidelines were then be presented to the former Cancer Network Board and the Network Medical Director who also signed the agreement sheet.

These guidelines were originally agreed by the Brain & CNS NSSG at the meeting held on the 24th of June 2011, subject to changes to the measures following publication. The new measures were discussed at the meeting on the 7th of October 2011. No changes were made to the guidelines.

There has been a subsequent revision of the guidelines to clarify the configuration of the MDTs and the Neurehabilitation Operational Policy was reviewed and became a separate document.

These guidelines were amended in April 2012, agreed by the group via email in May 2012.

The guidelines will be presented to the July CMG for their agreement.

<table>
<thead>
<tr>
<th>Present</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr S Achawal (Chair)</td>
<td>Consultant Neurosurgeon, HEYHT</td>
</tr>
<tr>
<td>Dr S Betmouni</td>
<td>Consultant Neuropathologist, HEYHT</td>
</tr>
<tr>
<td>Dr S Dixit</td>
<td>Consultant Clinical Oncologist, HEYHT</td>
</tr>
<tr>
<td>Mrs J Graham (Scribe)</td>
<td>Network Administrator, NEYHCA</td>
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<tr>
<td>Mr C Hurst</td>
<td>Macmillan Patient Experience Manager, NEYHCA</td>
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<tr>
<td>Ms L Ness</td>
<td>Clinical Lead Physiotherapist for Neurosurgery, HEYHT</td>
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<tr>
<td>Miss L Hobson</td>
<td>Trust Cancer Manager, NLGHFT</td>
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<tr>
<td>Mr B Jayawardhana</td>
<td>Consultant Rehabilitation Specialist, HEYHT</td>
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<tr>
<td>Ms L Laws</td>
<td>Business Manager, Neurosurgery, HEYHT</td>
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<tr>
<td>Dr J P Lazarus</td>
<td>Consultant Neurologist, NLGHFT</td>
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<tr>
<td>Mrs S McKiniry</td>
<td>Chair, Network AHP Group, NEYHCA</td>
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<tr>
<td>Mrs M Parrott</td>
<td>Trust Lead Cancer Manager, HEYHT</td>
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<tr>
<td>Mr A Pathak</td>
<td>Consultant Neurosurgeon, HEYHT</td>
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<td>Mr C Rajaraman</td>
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<tr>
<td>Mrs S Reid</td>
<td>Network Support Manager, NEYHCA</td>
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# Sign Off Sheet

**Agreement of the NEYHCA (Cancer) Guidelines for the Management of Adult Patients with Brain & Other CNS Tumours**

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<tr>
<th>Title</th>
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<tr>
<td>Chair of NEYHCA Board / Cancer Management Group (CMG)</td>
<td></td>
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<td>Mrs Allison Cooke</td>
<td>4.7.2012</td>
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| Chair of the Brain & CNS CEG / nMDT Lead, HEYHT |
| Mr Shailendra Achawal, Consultant Neurosurgeon | 11.5.2012 |

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| cMDT Lead, HEYHT |
| Dr Mohan Hingorani, Consultant Clinical Oncologist | 11.5.2012 |

Please see original signature sheet

| Pituitary MDT Lead, HEYHT |
| Mr Ashis Pathak, Consultant Neurosurgeon | 11.5.2012 |

Please see original signature sheet

| Clinical Lead, Scarborough and North East Yorkshire Healthcare NHS Trust |
| Mr Karl Mainprize | 4.7.2012 |

| Clinical Lead, Hull and East Yorkshire Hospitals NHS Trust |
| Dr Sam Khulusi | 4.7.2012 |

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<p>| Clinical Lead, Northern Lincolnshire &amp; Goole Hospitals NHS Foundation Trust |
| Dr Stuart Baugh | 4.7.2012 |</p>
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<td>Network Medical Director, NEYHCA (Cancer)</td>
<td>Professor Mike Lind</td>
<td>4.7.2012</td>
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<tr>
<td>Chair of the NEYHCA (Cancer) Imaging Clinical Expert Group</td>
<td>Dr Ged Avery</td>
<td>4.7.2012</td>
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<tr>
<td>Chair of the NEYHCA (Cancer) Pathology Clinical Expert Group</td>
<td>Dr Carol Hunt</td>
<td>4.7.2012</td>
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<tr>
<td>These Guidelines have been agreed by the Brain &amp; CNS Clinical Expert Group</td>
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<td>11.5.2012</td>
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